IMPERIAL COUNTY
AIR POLLUTION CONTROL DISTRICT

Highway 98 going West towards Ocotillo and Interstate 8 - http://i.ytimg.com/vi/oIvCxw3unFY/maxresdefault.jpg

April 25, 2014 and April 26, 2014
Exceptional Event Documentation
For the Imperial County PM_{10} Nonattainment Area

FINAL REPORT

August 20, 2018

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ACRONYM	DESCRIPTIONS
AQI	Air Quality Index
AQS	Air Quality System
BACM	Best Available Control Measures
BAM 1020	Beta Attenuation Monitor Model 1020
BLM	United States Bureau of Land Management
BP	United States Border Patrol
CAA	Clean Air Act
CARB	California Air Resources Board
CMP	Conservation Management Practice
DCP	Dust Control Plan
DPR	California Department of Parks and Recreation
EER	Exceptional Events Rule
EPA	Environmental Protection Agency
FEM	Federal Equivalent Method
FRM	Federal Reference Method
GOES-W/E	Geostationary Operational Environmental Satellite (West/East)
HF	Historical Fluctuations
HYSPLIT	Hybrid Single Particle Lagrangian Integrated Trajectory Model
ICAPCD	Imperial County Air Pollution Control District
ITCZ	Inter Tropical Convergence Zone
KBLH	Blythe Airport
KCZZ	Campo Airport
KIPL	Imperial County Airport
KNJK	El Centro Naval Air Station
KNYL/MCAS	Yuma Marine Corps Air Station
KPSP	Palm Springs International Airport
KTRM	Jacqueline Cochran Regional Airport (aka Desert Resorts Rgnl Airport)
LST	Local Standard Time
MMML/MXL	Mexicali, Mexico Airport
MPH	Miles Per Hour
MST	Mountain Standard Time
NAAQS	National Ambient Air Quality Standard
NCAR	National Center for Atmospheric Research
NCEI	National Centers for Environmental Information
NEAP	Natural Events Action Plan
NEXRAD	Next-Generation Radar
NOAA	National Oceanic and Atmospheric Administration
nRCP	Not Reasonably Controllable or Preventable
NWS	National Weather Service
PDT	Pacific Daylight Time
PM10	Particulate Matter less than 10 microns
PM2.5	Particulate Matter less than 2.5 microns

PST	Pacific Standard Time
QA/QC	Quality Assured and Quality Controlled
QCLCD	Quality Controlled Local Climatology Data
RACM	Reasonable Available Control Measure
RAWS	Remote Automated Weather Station
SIP	State Implementation Plan
SLAMS	State Local Ambient Air Monitoring Station
SMP	Smoke Management Plan
SSI	Size-Selective Inlet
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UTC	Coordinated Universal Time
WRCC	Western Regional Climate Center

I Introduction

On April 25, 2014 and April 26, 2014, State and Local Ambient Air Monitoring Stations (SLAMS), located in Brawley (AQS Site Code 060250007) measured an exceedance of the National Ambient Air Quality Standard (NAAQS). The Federal Equivalent Method (FEM), Beta Attenuation Monitor Model 1020 (BAM 1020) measured a (midnight to midnight) 24-hr average concentration of 184 µg/m^3 and 312 µg/m^3, respectively. PM_{10} 24-hr measurements measured above the 150 µg/m^3 are exceedances of the NAAQS. The SLAMS in Brawley was the only station, in Imperial County to measure an exceedance of the PM_{10} NAAQS on April 25, 2014 and April 26, 2014.

TABLE 1-1
CONCENTRATIONS OF PM_{10} ON APRIL 25, 2014 AND APRIL 26, 2014

DATE	MONITORING SITE	AQS ID	POC(s)	HOURS	24-HOUR CONCENTRATION µg/m^3	PM_{10} NAAQS µg/m^3
4/25/2014	**Brawley**	**06-025-0007**	**3**	**23**	**184**	**150**
4/26/2014	**Brawley**	**06-025-0007**	**3**	**23**	**312**	**150**
4/25/2014	Niland	06-025-4004	3	14	74	150
4/26/2014	Niland	06-025-4004	3	21	149	150

All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted[1]
April 25, 2014 and April 26, 2014 were not scheduled sampling days

The Imperial County Air Pollution Control District (ICAPCD) has been submitting PM_{10} data from Federal Reference Method (FRM) Size Selective Inlet (SSI) instruments since 1986 into the United States Environmental Protection Agency's (USEPA) Air Quality System (AQS). Prior to 2013 all continuous measured PM_{10} data was non-regulatory, thus measured in local conditions. However, by 2013 ICAPCD began formally submitting continuous FEM PM_{10} data from BAM 1020's into the USEPA managed AQS. Because regulatory consideration of reported data must be in standard conditions, as required by USEPA, all continuous PM_{10} data since 2013 is regulatory. On April 25, 2014 and April 26, 2014, the Brawley monitor was impacted by elevated particulate matter caused by the entrainment of fugitive windblown dust from high winds associated with a Pacific storm and accompanying powerful cold front that swept through the region.

This report demonstrates that the exceedance observed on April 25, 2014 and April 26, 2014 was caused by a naturally occurring event. The event elevated particulate matter which affected air quality, was not reasonably controllable or preventable (nRCP), was in excess of normal historical fluctuations (HF) and would not have occurred "but for" the entrainment of fugitive windblown dust from outlying natural open deserts and mountains of the Sonoran Desert. The document further substantiates the request by the ICAPCD to exclude the PM_{10} 24-hour NAAQS

[1] According to the National Institute of Standards and Technology (NIST) Time and Frequency Division the designation of the time of day for specific time zones are qualified by using the term “standard time” or “daylight time”. For year-round use the designation can be left off inferring “local time” daylight or standard whichever is present. For 2014, Pacific Daylight Time (PDT) is March 9 through November 2. https://www.nist.gov/pml/time-and-frequency-division/local-time-faqs#intl

exceedances of 184 µg/m^3 and 312 µg/m^3 as an exceptional event. This demonstration substantiates that this event meets the definition of the USEPA Regulation for the Treatment of Data Influenced by Exceptional Events (EER)[2].

I.1 Demonstration Contents

Section II - Describes the April 25, 2014 and April 26, 2014 event as it occurred in California and into Imperial County, providing background information of the exceptional event and explaining how the event affected air quality. Overall, this section provides the evidence that the event was a natural event.

Section III - Describes the normal historical fluctuations using data charts, summaries, and time-series graphs, which demonstrate that the elevated concentrations of PM_{10} on April 25, 2014 and April 26, 2014 were in excess of normal historical fluctuations.

Section IV - Provides evidence that the event of April 25, 2014 and April 26, 2014 was not reasonably controllable or preventable despite the full enforcement and implementation of Best Available Control Measures (BACM).

Section V - Discusses and establishes the clear causal relationship between the exceedance at the Brawley station and the natural event, which occurred on April 25, 2014 and April 26, 2014. This section provides evidence that the event affected air quality because of a natural event.

Section VI - Brings together the evidence presented within this report to show that the exceptional event was a natural event; that the event was not reasonably controllable or preventable; that there was a clear causal relationship between the natural event and the exceedance, and; that the event affected air quality.

I.2 Requirements of the Exceptional Event Rule

The above sections combined comprise the technical requirements described under the Exceptional Events Rule (EER) under 40 CFR §50.14(c)(3)(iv). However, in order for the USEPA to concur with flagged air quality monitoring data, there are additional non-technical requirements.

I.2.a Public Notification that a potential event was occurring (40 CFR §50.14(c)(1))

The ICAPCD and the National Weather Service (NWS) provided notification via the ICAPCD's webpage that winds 20 to 30 mph and gust to 40 miles per hour (mph) could affect this region potentially elevating particulate matter. Because of the potential for suspended particles and poor air quality, the ICAPCD issued a "No Burn" day in Imperial County April 25, 2014 and April 26, 2014. The ICAPCD posted the notices issued by the National Weather Service (NWS) Phoenix office warning of potential blowing dust and sand. **Appendix A** contains copies of notices

[2] "Treatment of Data Influenced by Exceptional Events; Final Rule", 72 FR 13560, March 22, 2007

pertinent to the April 25, 2014 and April 26, 2014 event.

I.2.b Initial Notification of Potential Exceptional Event (INPEE) (40 CFR §50.14(c)(2))

States are required under federal regulation to submit measured ambient air quality data into the AQS. AQS is the federal repository of Quality Assured and Quality Controlled (QA/QC) air ambient data used for regulatory purposes. Ambient data that is potentially influenced by an exceptional event must be appropriately flagged and initially described and submitted to USEPA according to 40 CFR § 50.14(c)(2)(iii) no later than July 1st of the calendar year following the year in which the flagged measurement occurred.

The ICAPCD made a written request to the California Air Resources Board (CARB) to place preliminary flags on SLAMS measured concentrations in Brawley. The request, dated May 28, 2015 requested an initial flag for the measurements from the BAM 1020 in Brawley of 184 $\mu g/m^3$ and 312 $\mu g/m^3$. Subsequently, after submittal of the request, CARB received corrected FEM data measurements in standard conditions, originally submitted in local conditions. USEPA requires data in standard conditions when making regulatory decisions. A brief description was included with the initial flag of the meteorological data, which indicated a potential natural event had occurred on April 25, 2014 and April 26, 2014.

I.2.c Documentation that the public comment process was followed for the event demonstration that was flagged for exclusion (40 CFR §50.14(c)(3)(v))

The ICAPCD posted, for a 30-day public review, a draft version of this demonstration on the ICAPCD webpage and published a notice of availability in the Imperial Valley Press on January 4, 2017. The notice advised the public that comments were being solicited regarding this demonstration, which supports the request, by the ICAPCD to exclude the measured concentration of 184 $\mu g/m^3$ and 312 $\mu g/m^3$, which occurred on April 25, 2014 and April 26, 2014 at the Brawley monitor. The final closing date for comments was February 3, 2017. **Appendix A** contains a copy of the public notice affidavit along with any comments received by the ICAPCD for submittal as part of the demonstration (40 CFR §50.14(c)(3)(i)).

I.2.d Documentation submittal supporting an Exceptional Event Flag (40 CFR §50.14(c)(3)(i))

States that have flagged data as a result of an exceptional event and who have requested an exclusion of said flagged data are required to submit a demonstration that justifies the data exclusion to the USEPA in accordance with the due date established by USEPA during the INPEE process (40 CFR §50.14(c)(2)). Currently, bi-weekly meetings between USEPA, CARB and Imperial County are set to discuss each flagged exceedance.

The ICAPCD, after the close of the comment period and after consideration of the comments will submit this demonstration along with all required elements, including received comments and responses to USEPA Region 9 in San Francisco, California. The submittal of the April 25, 2014 and April 26, 2014 demonstration will have a regulatory impact upon the development and ultimate

submittal of the PM_{10} State Implementation Plan for Imperial County in 2018.

I.2.e Necessary demonstration to justify an exclusion of data under (40 CFR§50.14(c)(3)(iv))

A This demonstration provides evidence that the event, as it occurred on April 25, 2014 and April 26, 2014, satisfies the definition in 40 CFR §50.1(j) and (k) for an exceptional event.

a The event "affects air quality"
b The event "is not reasonably controllable or preventable."
c The event is "caused by human activity that is unlikely to recur at a particular location or [is] a natural event."
d The event is a "natural event" where human activity played little or no direct causal role.

B This demonstration provides evidence that air quality was affected by the exceptional event in Imperial County. There is a clear causal relationship between the event and the measured concentrations in Brawley supporting that the event affected the air quality in Imperial County.

C This demonstration provides evidence that the measured concentration, caused by the event, is in excess of normal historical fluctuations.

D This demonstration provides evidence that "but-for" the event there would have been no exceedance.

II April 25, 2014 and April 26, 2014 Conceptual Model

This section provides a summary description of the meteorological and air quality conditions under which the April 25, 2014 and April 26, 2014 event unfolded in Imperial County. The subsection elements include

- » A description and map of the geographic setting of the air quality and meteorological monitors
- » A description of Imperial County's climate
- » An overall description of meteorological and air quality conditions on the event day.

II.1 Geographic Setting and Monitor Locations

According to the United States Census Bureau, Imperial County has a total area of 4,482 square miles of which 4,177 square miles is land and 305 square miles is water. Much of Imperial County is below sea level and is part of the Colorado Desert an extension of the larger Sonoran Desert (**Figure 2-1)**. The Colorado Desert not only includes Imperial County but a portion of San Diego County.

FIGURE 2-1
COLORADO DESERT AREA IMPERIAL COUNTY

Fig 2-1: 1997 California Environmental Resources Evaluation System. According to the United States Geological Survey (USGS) Western Ecological Research Center the Colorado Desert bioregion is part of the bigger Sonoran Desert Bioregion which includes the Colorado Desert and Upper Sonoran Desert sections of California and Arizona, and a portion of the Chihuahuan Basin and Range Section in Arizona and New Mexico (Forest Service 1994)

A notable feature in Imperial County is the Salton Sea, which is at 235 feet below sea level. The Chocolate Mountains are located east of the Salton Sea and extend in a northwest-southeast direction for approximately 60 miles (**Figure 2-2)**. In this region, the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect the northern-most extensions of the East Pacific rise. Consequently, the region is subject to earthquakes and the crust is being stretched, resulting in a sinking of the terrain over time.

FIGURE 2-2
SURROUNDING AREAS OF THE SALTON SEA

Fig 2-2: Image courtesy of the Image Science and Analysis Laboratory NASA Johnson Space Center, Houston Texas

All of the seven incorporated cities, including the unincorporated township of Niland, are surrounded by agricultural fields to the north, east, west and south (**Figure 2-3)**. Together, the incorporated cities, including Niland, and the agricultural fields make what is known as the Imperial Valley. Surrounding the Imperial Valley are desert areas found on the eastern and western portions of Imperial County.

FIGURE 2-3
LOCATION AND TOPOGRAPHY OF IMPERIAL COUNTY

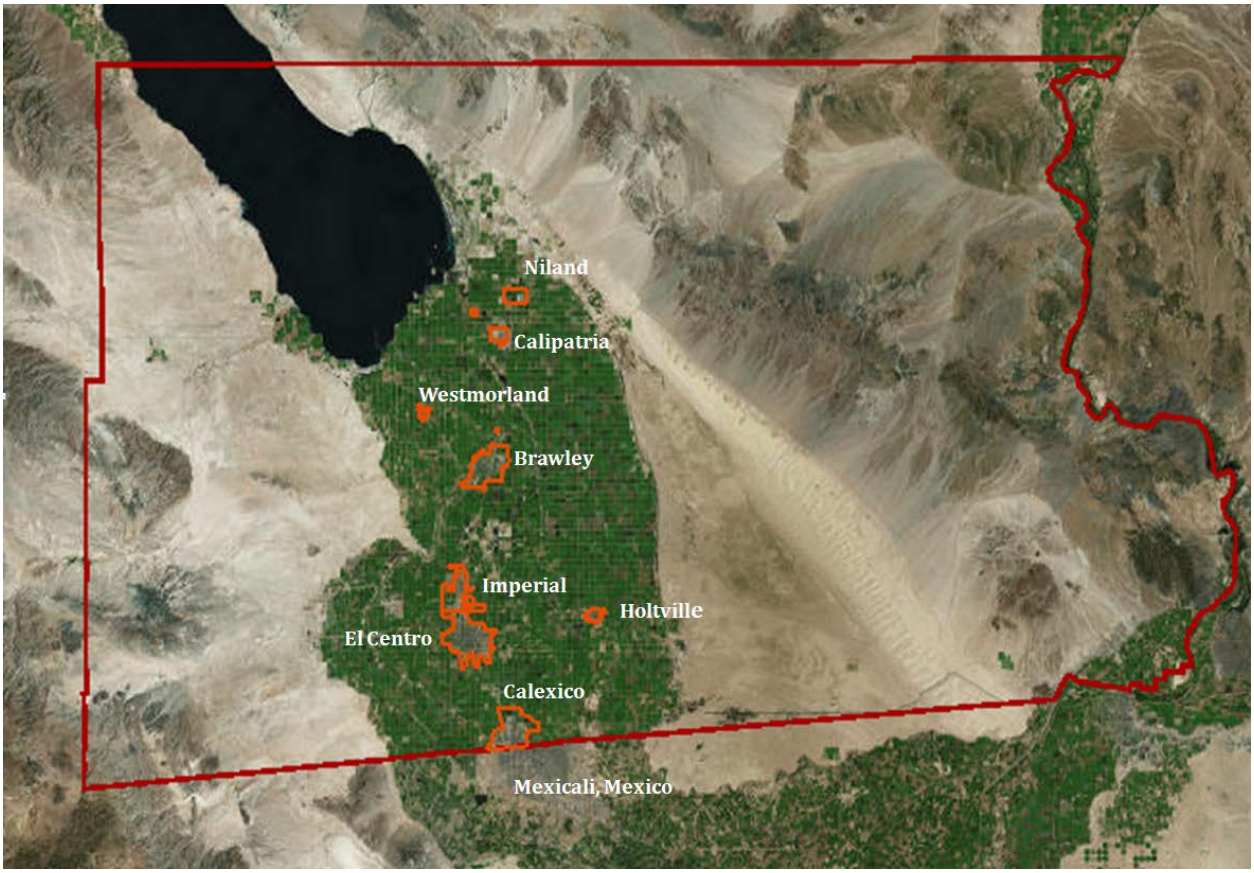


Fig 2-3: Depicts the seven incorporated cities within Imperial Valley - City of Calipatria, City of Westmorland, City of Brawley, City of Imperial, City of El Centro, City of Holtville, City of Calexico. Niland is unincorporated. Mexicali, Mexico is to the south

Furthermore, the deserts which surround Imperial Valley located to the east and west stretch into Mexico, also known as the Sonoran Desert (**Figure 2-4)**. Combined, these deserts are sources of dust emissions, which affect the Imperial County during high wind events.

FIGURE 2-4
DESERTS IN SE CALIFORNIA, SW ARIZONA, AND NORTHERN MEXICO

Fig 2-4: Depicts the Sonoran Desert as it extends from Mexico into Imperial County. Source: Google Earth Terra Matrics

The air quality and meteorological monitoring stations used in this demonstration are shown in **Figure 2-5**. Of the five SLAMS within Imperial County, four stations measure both meteorological and air quality data. These SLAMS are located in Calexico, El Centro, Westmorland, and Niland; the station located in Brawley only measures air quality. Other air monitoring stations measuring air quality and meteorological data used for this demonstration include stations in eastern Riverside County, southeastern San Diego County and southwestern Arizona (Yuma County) (**Figure 2-5 and Table 2-1)**.

As mentioned above, the PM_{10} exceedances on April 25, 2014 and April 26, 2014, occurred at the Brawley station. The Brawley station is regarded as a "northern" monitoring site within the Imperial County air monitoring network. In order to properly analyze the contributions of meteorological conditions occurring on April 25, 2014 and April 26, 2014, other meteorological sites used in this demonstration include airports in eastern Riverside County, southern San Diego County, southwestern Yuma (Arizona) County, northern Mexico, and Imperial County, along with other sites relevant to the wind event (**Figure 2-5 and Appendix B)**.

FIGURE 2-5
MONITORING SITES IN AND AROUND IMPERIAL COUNTY

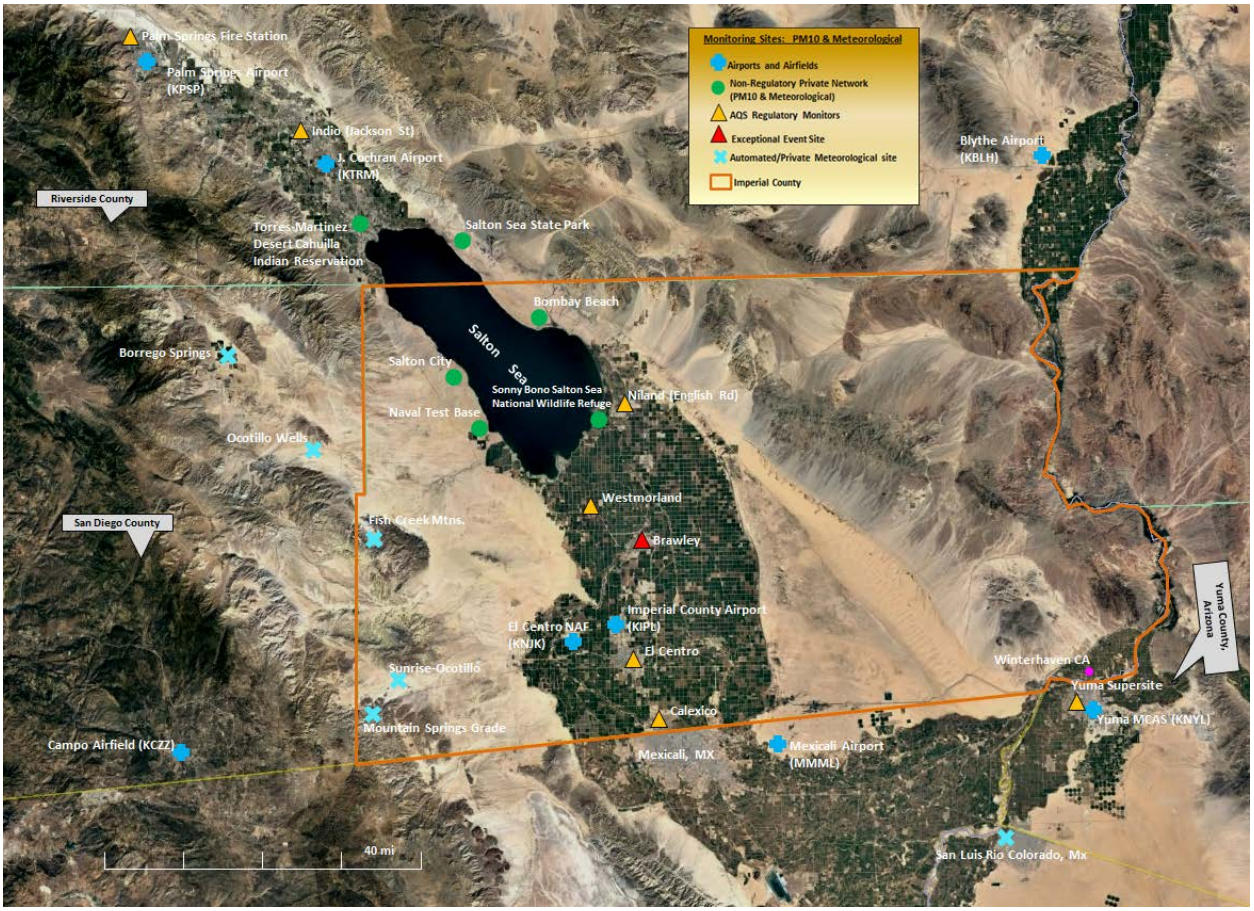


Fig 2-5: Depicts a select group of meteorological and PM_{10} monitoring sites in Imperial County, eastern Riverside County, southeastern San Diego County, southwestern Arizona (Yuma County), and northern Mexico. The image provides the location of potential sites used to gather data in support an Exceptional Event Demonstration. Source: Google Earth

TABLE 2-1
MONITORING SITES IN IMPERIAL COUNTY, RIVERSIDE COUNTY AND ARIZONA
APRIL 25, 2014 AND APRIL 26, 2014

Monitor Site Name	*Operator	Monitor Type	AQS ID	AQS PARAMETER CODE	ARB Site Number	Elevation (meters)	Day	24-hr PM_{10} ($\mu g/m^3$) Avg	1-hr PM_{10} ($\mu g/m^3$) Max	**Time of Max Reading	Max Wind Speed (mph)	**Time of Max Wind Speed
IMPERIAL COUNTY												
Brawley-Main Street #2	ICAPCD	Hi-Vol Gravimetric	06-025-0007	(81102)	13701	-15	25	-	-	-	-	-
		BAM 1020						184	943	1900		
		Hi-Vol Gravimetric					26	-	-	-	-	-
		BAM 1020						312	828	1200		
Calexico-Ethel Street	CARB	Hi-Vol Gravimetric	06-025-0005	(81102)	13698	3	25	-	-	-	20.3	1900
							26	-	-	-	20.8	800
El Centro-9th Street	ICAPCD	Hi-Vol Gravimetric	06-025-1003	(81102)	13694	9	25	-	-	-	15.7	1800
							26	-	-	-	14.7	1000
Niland-English Road	ICAPCD	Hi-Vol Gravimetric	06-025-4004	(81102)	13997	-57	25	-	-	-	26.9	2200
		BAM 1020					26	74	396	1400		
		Hi-Vol Gravimetric					25	-	-	-	23.7	800
		BAM 1020					26	149	404	900		
Westmorland	ICAPCD	Hi-Vol Gravimetric	06-025-4003	(81102)	13697	-43	25	-	-	-	-	-
							26	-	-	-	-	-
RIVERSIDE COUNTY												
Palm Springs Fire Station	SCAQMD	TEOM	06-065-5001	(81102)	33137	174	25	49	149	1400	-	-
							26	12	36	2200	-	-
Indio (Jackson St.)	SCAQMD	TEOM	06-065-2002	(81102)	33157	1	25	40	72	1900	-	-
							26	45	225	1700	-	-
ARIZONA – YUMA												
Yuma Supersite	ADEQ	TEOM	04-027-8011	(81102)	N/A	60	25	285	2532	800	-	-
							26	235	1012	1000	-	-

*CARB = California Air Resources Board

*ICAPCD = Air Pollution Control District, Imperial County

*SCAQMD = South Coast Air Management Quality District

*ADEQ =Arizona Department of Environmental Quality

**Time represents the actual time/hour of the measurement in question according to the zone time (PST unless otherwise noted)

II.2 Climate

As mentioned above, Imperial County is part of the Colorado Desert, which is a subdivision of the larger Sonoran Desert (**Figure 2-6**) encompassing approximately 7 million acres (28,000 km^2). The desert area encompasses Imperial County and includes parts of San Diego County, Riverside County, and a small part of San Bernardino County.

FIGURE 2-6
SONORAN DESERT REGION

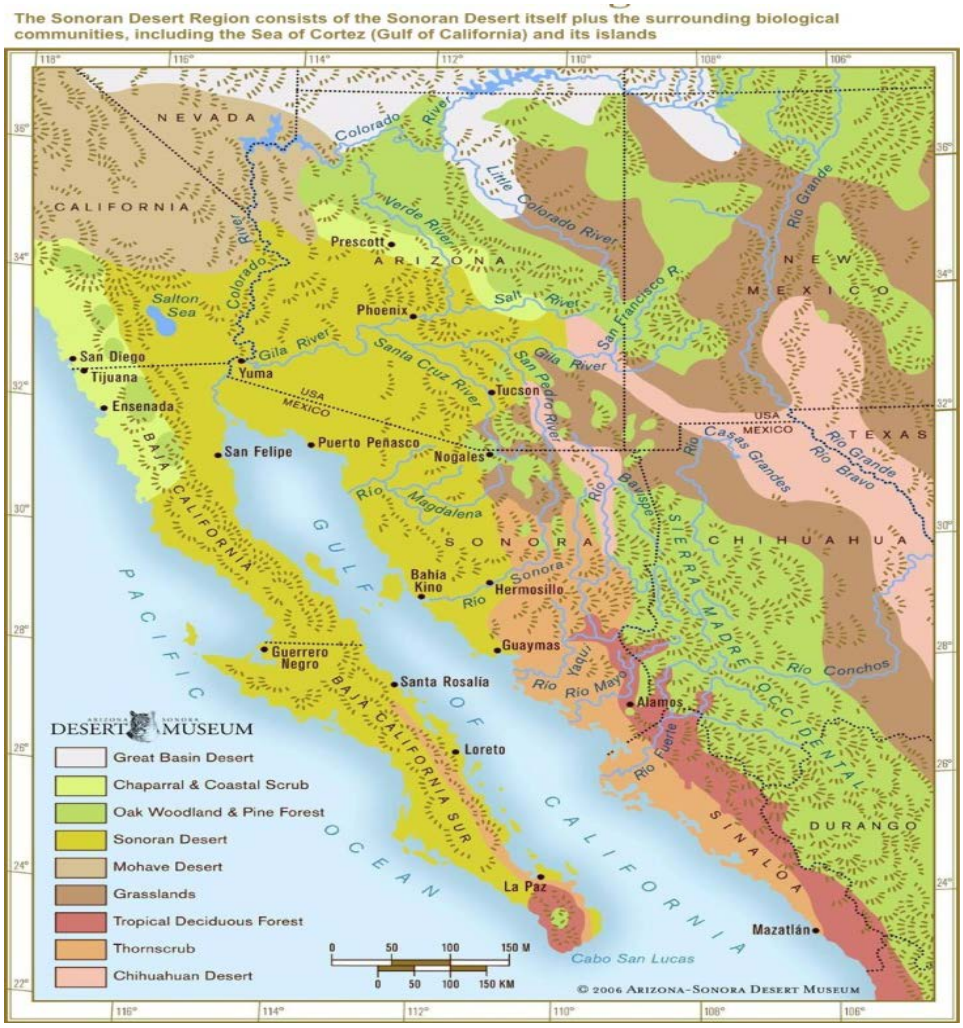


Fig 2-6: Depicts the magnitude of the region known as the Sonoran Desert. Source: Arizona-Sonora Desert Museum at http://desertmuseum.org/center/map.php

The majority of the Colorado Desert lies at a relatively low elevation, below 1,000 feet (300 m), with the lowest point of the desert floor at 275 feet (84 m) below sea level at the Salton Sea. Although the highest peaks of the Peninsular Range reach elevations of nearly 10,000 feet (3,000 m), most of the region's mountains do not exceed 3,000 feet (910 m).

In the Colorado Desert (Imperial County), the geology is dominated by the transition of the tectonic plate boundary from rift to fault. The southernmost strands of the San Andreas Fault connect to the northern-most extensions of the East Pacific Rise. Consequently, the region is subject to earthquakes, and the crust is being stretched, resulting in a sinking of the terrain over time.

The Colorado Desert's climate distinguishes it from other deserts. The region experiences greater summer daytime temperatures than higher-elevation deserts and almost never experiences frost. In addition, the Colorado Desert experiences two rainy seasons per year (in the winter and late summer), especially toward the southern portion of the region; the more northerly Mojave Desert usually has only winter rains.

The west coast Peninsular Ranges, or other west ranges, of Southern California–northern Baja California, block most eastern Pacific coastal air and rains, producing an arid climate. Other short or longer-term weather events can move in from the Gulf of California to the south, and are often active in the summer monsoons. These include remnants of Pacific hurricanes, storms from the southern tropical jet stream, and the northern Inter Tropical Convergence Zone (ITCZ).

The arid nature of the region demonstrated when historic annual average precipitation levels in Imperial County average 3.11" (**Figure 2-7)**. During the 12-month period prior to April 25, 2014 and April 26, 2014, Imperial County recorded total annual precipitation of 2.12 inches.

FIGURE 2-7
IMPERIAL COUNTY HISTORICAL WEATHER

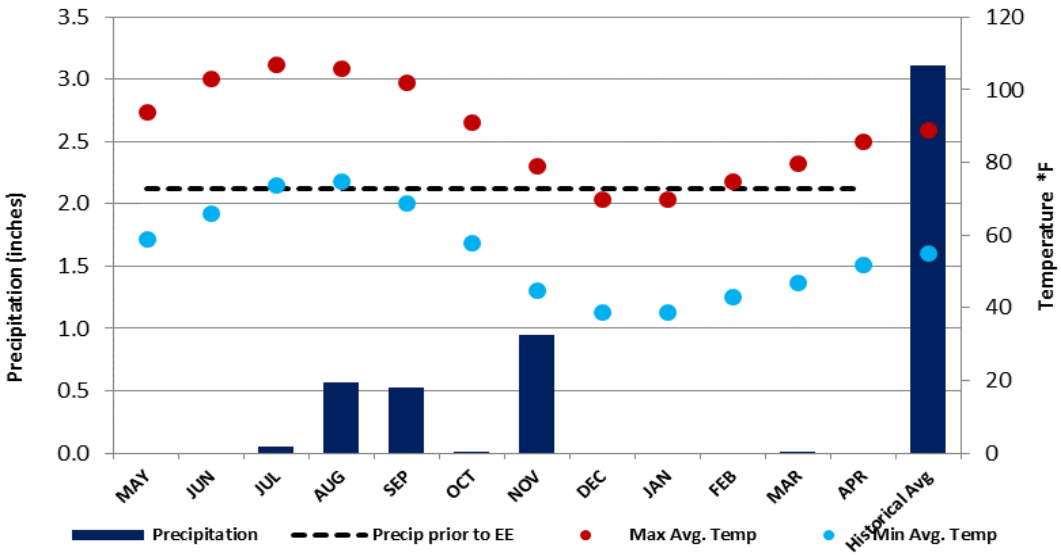


Fig 2-7: Prior to April 25, 2014 and April 26, 2014, the region had suffered abnormally low precipitation of 2.12 inches. Average annual precipitation is 3.11 inches. Meteorological data courtesy of Western Regional Climate Center (WRCC) and Weather Underground http://www.wrcc.dri.edu/cgi-bin/climain.pl?ca2713

The NWS explains that the speed of any wind resulting from a weather system is directly proportional to the change in air pressure, called a pressure gradient, such that when the pressure gradient increases so does the speed of the wind.[3] Because the pressure gradient is just the difference in pressure between high and low pressure areas, changes in weather patterns

[3] NWS JetStream – Origin of Wind http://www.srh.noaa.gov/jetstream/synoptic/wind.html

may recur seasonally.

Typically, high pressure brings clear skies and with no clouds, there is more incoming shortwave solar radiation causing temperatures to rise. When surface winds become light, the cooling of the air produced directly under a high-pressure system can lead to a buildup of particulates in urban areas under an elongated region of relatively high atmospheric pressure or ridge causing widespread haze. Conversely, a trough is an elongated region of relatively low atmospheric pressure often associated with fronts. Troughs may be at the surface, or aloft under various conditions. Most troughs bring clouds, showers, and a wind shift, particularly following the passage of the trough.

While windblown dust events in Imperial County during the summer monsoon season are often due to outflow winds from thunderstorms, windblown dust events in the fall, winter, and spring are usually due to strong winds associated with low-pressure systems and cold fronts moving southeast across California. These winds are the result of strong surface pressure gradients between the approaching low-pressure system, accompanying cold front, and higher pressure ahead of it. As the low-pressure system and cold front approaches and passes, gusty southwesterly winds typically shift to northwesterly causing variable west winds. These strong winds entrain dust into the atmosphere and transport it over long distances, especially when soils are arid.

II.3 Event Day Summary

The exceptional event for April 25, 2014 through April 26, 2014, caused when an upper level trough of low-pressure moved through Southern California late Friday and Saturday, as forecasted by the NWS in Phoenix and San Diego affected the regional area encompassing the San Diego Mountains and deserts, Imperial and Riverside Counties and Arizona.[4] As the low-pressure strengthened over the Great Basin, surface onshore gradients deepened generating, strong gusty southwest to west winds over the San Diego Mountains and adjacent deserts.

The NWS offices in San Diego and Phoenix both issued area forecast discussions regarding the strong, large and cold low-pressure system as early as Wednesday, April 23, 2014. Both NWS offices expected strong winds as the system entered and moved east towards Arizona. As such, both offices issued Urgent Weather Messages containing, Wind Advisories, High Wind Warnings and Blowing Dust Advisories. In addition, the Phoenix office issued four (4) Hazardous Weather Outlooks that contained any spotter information in addition to the Wind Advisories and Blowing Dust Advisories. The San Diego NWS office issued Public Information Statements, identifying the highest wind speeds and the strongest measured wind gusts as well as storm reports for the service area including Riverside and San Diego counties.[5] The Phoenix NWS office issued

[4] Area Forecast Discussion National Weather Service Phoenix AZ, 810 PM PST (910 PM MST); San Diego CA, 830 PM PST (930 PM PDT) Friday, April 25, 2014; San Diego CA, 210 AM PST (310 AM PDT) and Phoenix AZ, 905 AM PST (1005 AM MST) Saturday, April 26, 2014

[5] Public Information Statement, Corrected, National Weather Service, San Diego CA 635 PM PST (735 PM PDT) and 645 PM PST (745 PM PDT) Saturday, April 26, 2014

Preliminary Local Storm reports one of which identified gusts at the El Centro Naval Air Facility (KNJK) at 52mph. All in all the San Diego NWS office issued eight (8) Urgent Weather Messages while the Phoenix NWS office issued nine (9) with four (4) Hazardous Weather Outlooks.

On April 25, 2014 and April 26, 2014 strong and gusty southwest to west winds over the mountains and deserts of San Diego County, associated with a strong and cold deep Pacific trough that moved inland into Southern California, transported windblown dust emissions into Imperial County affecting air quality and causing an exceedance at the Brawley monitor.

Figures 2-8 and 2-9 show the progression of the weather system and cold front through the region over a two-day period.

FIGURE 2-8
SATELLITE SURFACE COMPOSITE APRIL 25, 2014 AND APRIL 26, 2014

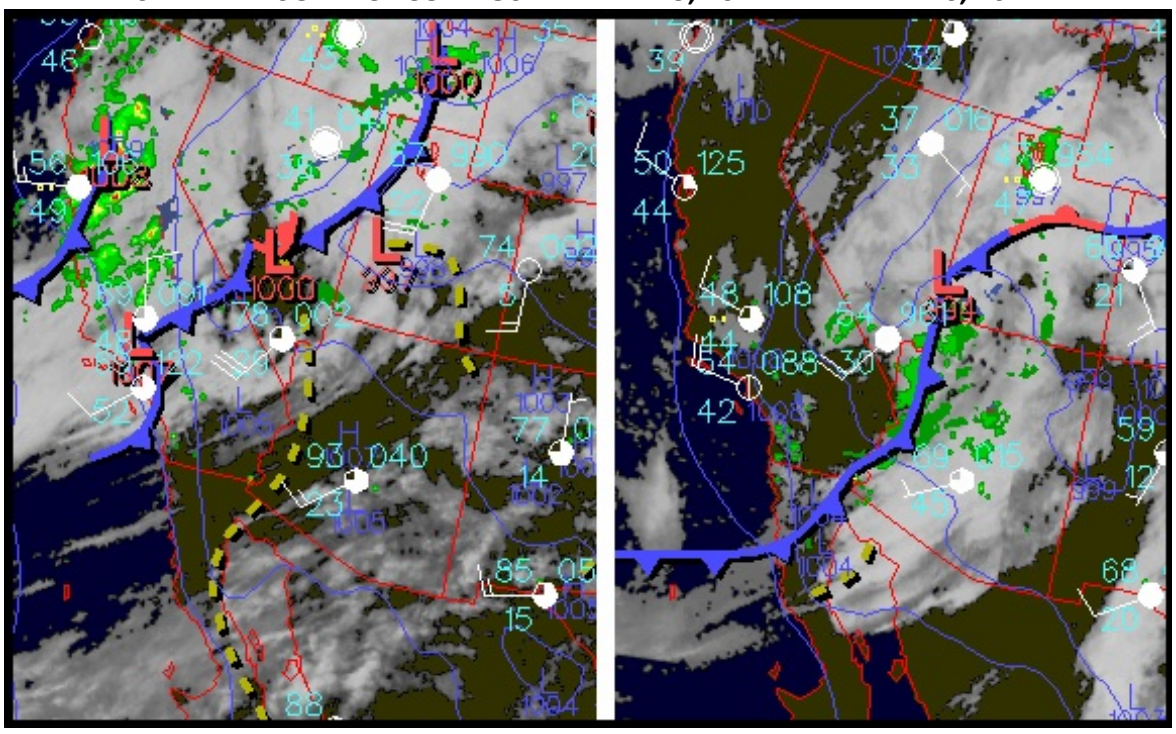


Fig 2-8: Satellite surface composite maps for April 25, 2014 and April 26, 2014 show the movement of the weather system that struck the area over a two-day period. Left image is at 14:30 PST on April 25, 2014. By 05:30 PST on April 26, 2014 the cold front was over the southeastern portion Imperial County, near the edge of the California-Arizona border. Source: Unisys Corporation

FIGURE 2-9
GOES-W VISIBLE SATELLITE APRIL 25, 2014 AND APRIL 26, 2014

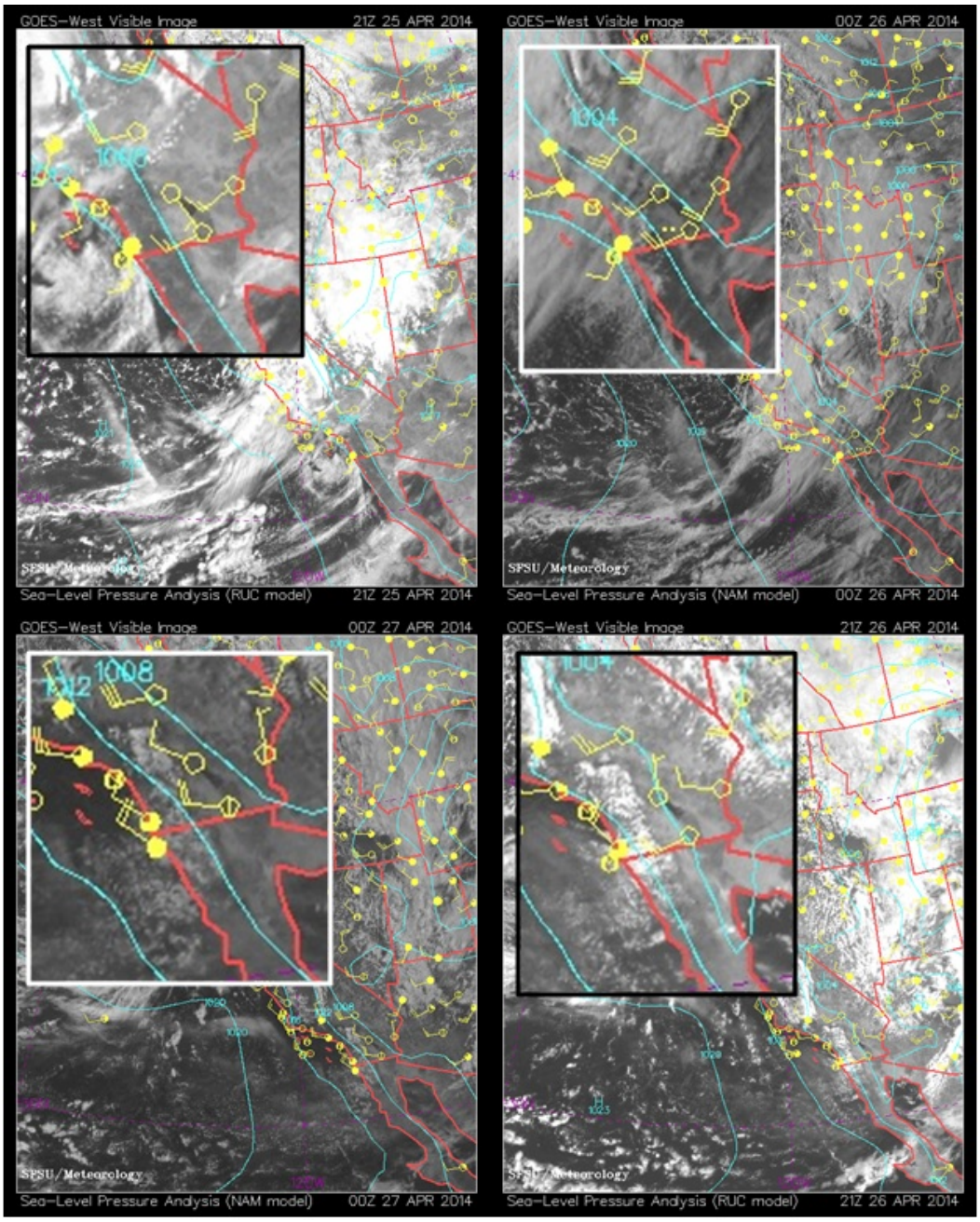


Fig 2-9: GOES-W satellite visible composite images at (clockwise, from top left) 13:00 PST April 25, 2014; 16:00 PST April 25, 2014; 13:00 PST April 26, 2014; and 16:00 PST April 26, 2014. Wind barbs superimposed over the images show winds over Imperial County were approximately 28.8 mph at 16:00 April 26, 2014 (top right image). Wind barbs also show how the wind direction shifted as the system passed through the area. Winds were initially from the southwest (top left image) but had shifted to west west-northwest (bottom left) 24 hours later. Source: SFSU Department of Earth and Climate Sciences and the California Regional Weather Server

The upper-level trough resulted in winds outside the normal historical average for the Brawley monitoring site**.** The NWS Phoenix office issued an Urgent Weather Message that included a wind advisory at 02:06 MST on Friday, April 25, 2014 for southeastern California including El Centro and Blythe, along with portions of the Salton Sea; the lower Colorado River valley, and; the southwest deserts of Arizona including Tacna and Wellton east of Yuma. Gusty westerly winds to 25 mph to 35 mph were expected, with gusts up to 50 mph. Travel on Interstate 8 and Interstate 10 was expected to be impacted by blowing dust. At 1432 on April 25, 2014, the wind advisory was extended through 20:00 on April 26, 2014. An Area Forecast Discussion issued at 1005 MST on April 26, 2014 contained a blowing dust advisory for southeastern California in effect until 1600. See **Appendix A** for issued notices. As the weather system moved into Imperial County, strong winds did in fact occur. **Figures 2-10 and 2-11** provide a graphical demonstration of the chain of events for April 25, 2014 and April 26, 2014.

FIGURE 2-10
RAMP-UP ANALYSIS APRIL 25, 2014

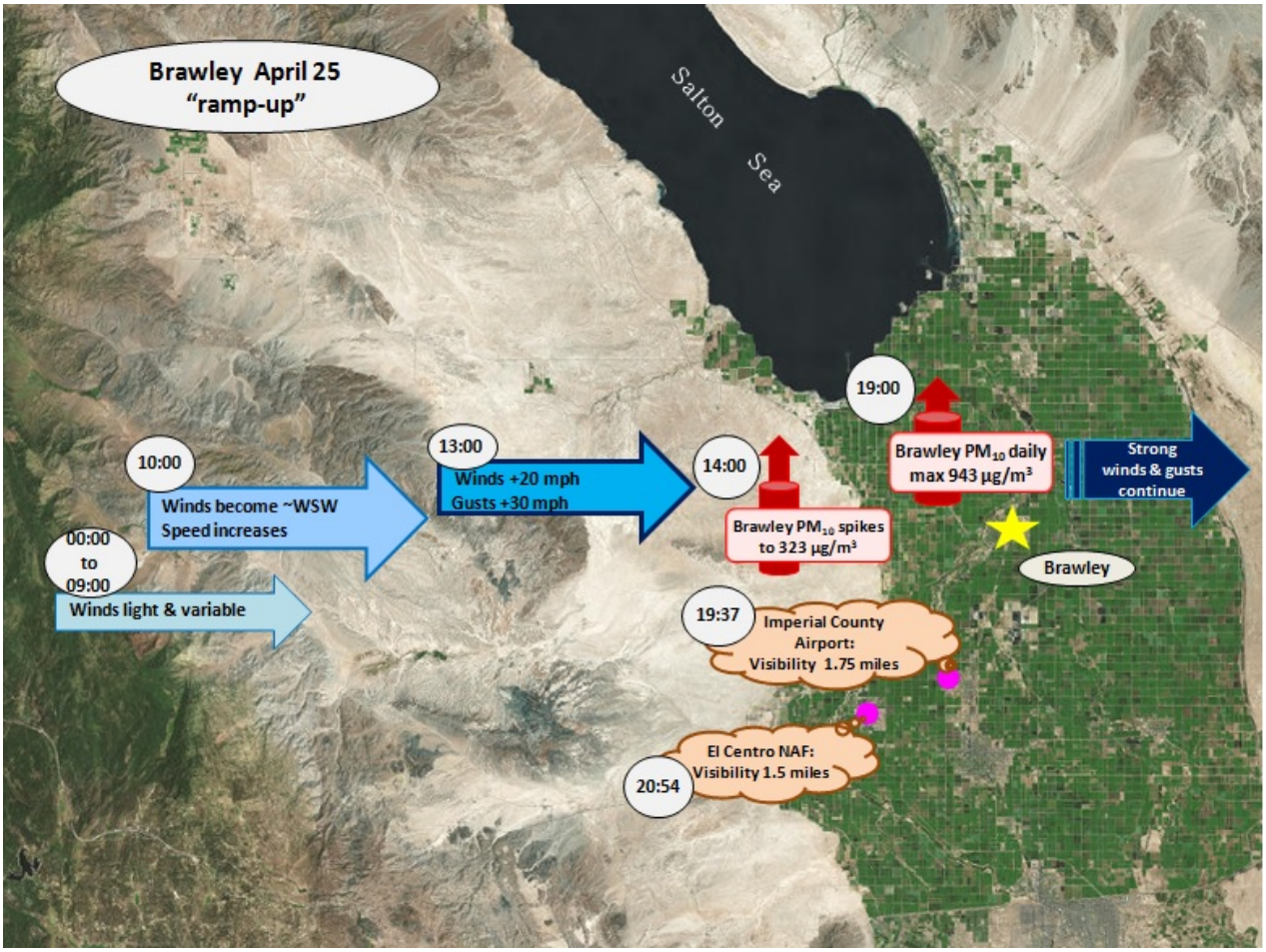


Fig 2-10: The image illustrates the ramp-up analysis for April 25, 2014. A change in wind direction was coincident with elevated wind speeds and gusts. Darker-colored arrows indicate the increasing wind speed. Meteorological data for Imperial Airport and El Centro NAF from the NCEI's QCLCD data bank. Base map from Google Earth

As measured by meteorological instruments at Imperial County Airport (KIPL) and the El Centro NAF (KNJK), at 10:00 variable winds shifted to the west-southwest. Wind speeds increased and were accompanied by strong gusts. Both KIPL and KNJK measured multiple and sometimes consecutive hours of winds at or above the 25 mph threshold. KNJK measured multiple hours of winds at or above 25 mph on April 26, 2014, while KIPL measured one hour of winds above 25 mph. On April 26, 2014, KNJK reported several observations of blowing dust due to the high winds. The W to WSW direction and increase in wind speeds held constant through April 26, 2014. Winds and gusts finally subsided by 0500 on April 27, 2014 as the system moved out of the area. Both the Brawley and Niland monitors measured elevated concentrations as early as 1400 PST April 25, 2014 through April 26, 2014. The Niland monitor failed to function within critical criteria parameters on April 25, 2014 and April 26, 2014. As such, Niland had nine hours of invalid measurements on April 25, 2014 and three hours of invalid measurements on April 26, 2014. More than likely, Niland would have measured an exceedance but for the hours of invalidation.

FIGURE 2-11
RAMP-UP ANALYSIS APRIL 26, 2014

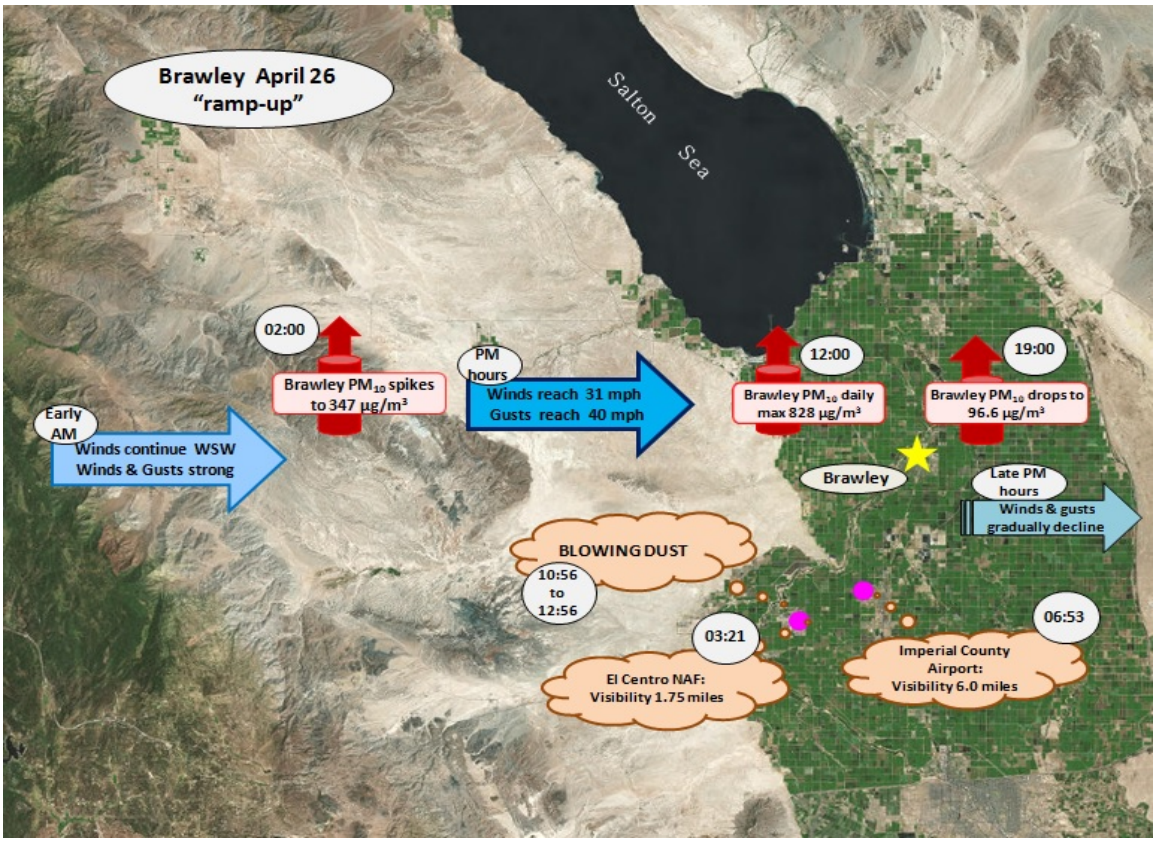


Fig 2-11: A ramp-up analysis for the Brawley station on April 26, 2014. Strong, gusty W to WSW winds continued through April 26, 2014. El Centro NAF experienced blowing dust due to the high winds. Darker-colored arrows indicate the increasing wind speed. Meteorological data for Imperial Airport and El Centro NAF Meteorological data from the NCEI's QCLCD data bank. Base map from Google Earth

Table 2-2 has a summary of maximum winds, peak wind gusts, and wind direction at monitors in Imperial County, eastern Riverside County, Yuma County, Arizona, and Mexicali, Mexico. For detailed meteorological station, graphs see **Appendix B**.

TABLE 2-2
WIND SPEEDS ON APRIL 25, 2014 AND APRIL 26, 2014

Station Monitor Airport Meteorological Data	Day	Maximum Wind Speed (WS) (mph)	Wind Direction during Max WS (degrees)	*Time of Max Wind Speed	24 hr Maximum Wind Gust (WG) (mph)	Time of Max WG	PM_{10} correlated to time of Max Wind Speed	
							Brly	Nlnd
IMPERIAL COUNTY								
Imperial Airport (KIPL)	25	30	250	1753	40	1853	441	-
	26	29	280	753	40	753	574	61.3
Naval Air Facility (KNJK)	25	38	240	2054	49	2116	-	-
	26	40	270	321	52	321	817	39.3
Calexico (Ethel St)	25	20.3	277	1900	-	-	943	-
	26	20.8	269	800	-	-	460	364.7
El Centro (9th Street)	25	15.7	258	1800	-	-	359	-
	26	14.7	260	1000	-	-	288	142.1
Niland (English Rd)	25	26.9	263	2200	-	-	148	-
	26	23.7	261	800	-	-	460	364.7
RIVERSIDE COUNTY								
Blythe Airport (KBLH)	25	34	230	1852	40	1710	359	-
	26	30	260	752	36	752	574	61.3
Palm Springs Airport (KPSP)	25	21.9	330	1553	33	1653	259	-
	26	26.5	330	353	43	353	817	39.3
Jacqueline Cochran Regional Airport (KTRM) - Thermal	25	27.6	270	2252	40	2252	148	-
	26	20.7	280	452	33	452	175	15
ARIZONA - YUMA								
Yuma MCAS (KNYL)*MST	25	20	280	2221	26	1938	148	-
	26	33	310	911	49	911	182	404.5
MEXICALI - MEXICO								
Mexicali Int. Airport (MXL)	25	21.9	260	2000	-	-	-	-
	26	29.9	280	747	-	-	574	61.3

*All time referenced throughout this document is in Pacific Standard Time (PST) unless otherwise noted

National Oceanic and Atmospheric Administration (NOAA) Air Resources Laboratory HYSPLIT back trajectory model,[6] depicted in **Figure 2-12**, indicates the path of airflow in the hours leading up to the wind event on April 25, 2014. **Figure 2-13** indicates the path of airflow as the wind event

[6] The Hybrid Single Particle Lagrangian Integrated Trajectory Model (**HYSPLIT**) is a computer model that is a complete system for computing simple air parcel trajectories to complex dispersion and deposition simulations. It is currently used to compute air parcel trajectories and dispersion or deposition of atmospheric pollutants. One popular use of HYSPLIT is to establish whether high levels of air pollution at one location are caused by transport of air contaminants from another location. HYSPLIT's back trajectories, combined with satellite images (for example, from NASA's MODIS satellites), can provide insight into whether high air pollution levels are caused by local air pollution sources or whether an air pollution problem was blown in on the wind The initial development was a result of a joint effort between NOAA and Australia's Bureau of Meteorology. Source: NOAA/Air Resources Laboratory, 2011.

continued into April 26, 2014. Both trajectories indicate airflow primarily from the west over the San Diego Mountains through the passes over natural open deserts and farmland in Imperial County. Modeled winds may differ from local conditions. Data used in the HYSPLIT model has a horizontal resolution of 12 km integrated every three hours. Thus, the HYSPLIT model may differ from local observed surface wind speeds and directions. The elevated levels of PM_{10} concentrations measured in Riverside, Imperial and Yuma counties illustrate the regional nature of the event. The existing meteorological conditions resulted in elevated concentrations of PM_{10} in Imperial County, affecting air quality and causing an exceedance at the Brawley monitor on April 25, 2014 and April 26, 2014. In addition, because of several invalidated hours at the Niland monitor, in all likelihood the Niland monitor would have similarly measured an exceedance on both days.

FIGURE 2-12
HYSPLIT MODEL APRIL 25, 2014

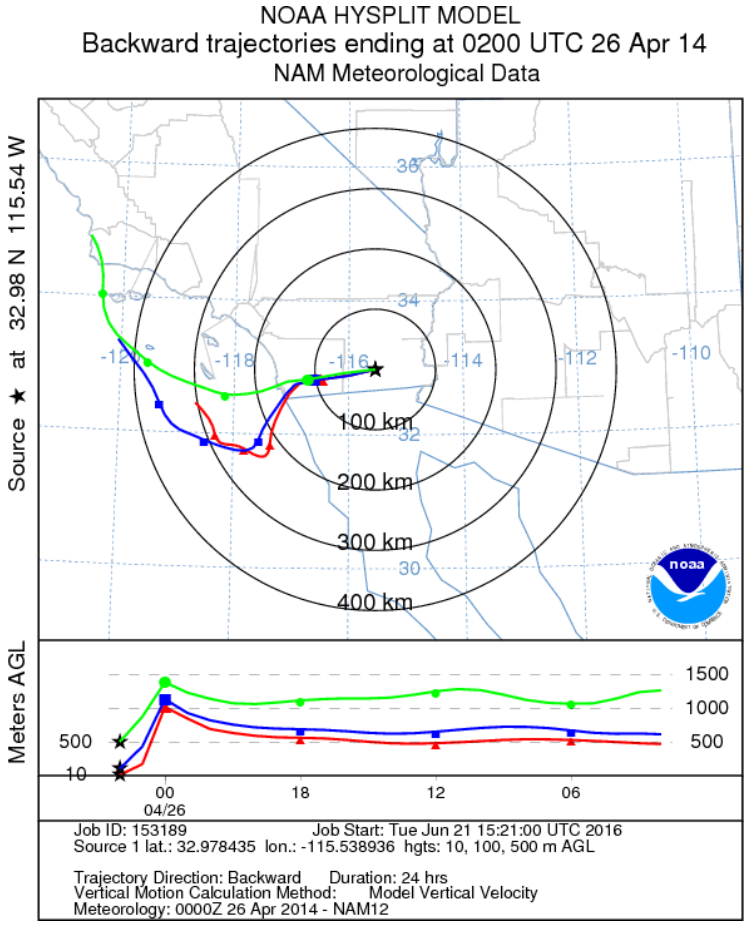


Fig 2-12: Brawley 24-hour back trajectory ending at 19:00 PDT on April 25, 2014 coincident with the measured hourly peak concentration. Red represents air movement at 10 meters above ground level (AGL); Blue represents air movement at 100 meters above ground level (AGL); Green represents air movement at 500 meters above ground level (AGL). Image generated through NOAA Air Resources Laboratory HYSPLIT

FIGURE 2-13
HYSPLIT MODEL APRIL 26, 2014

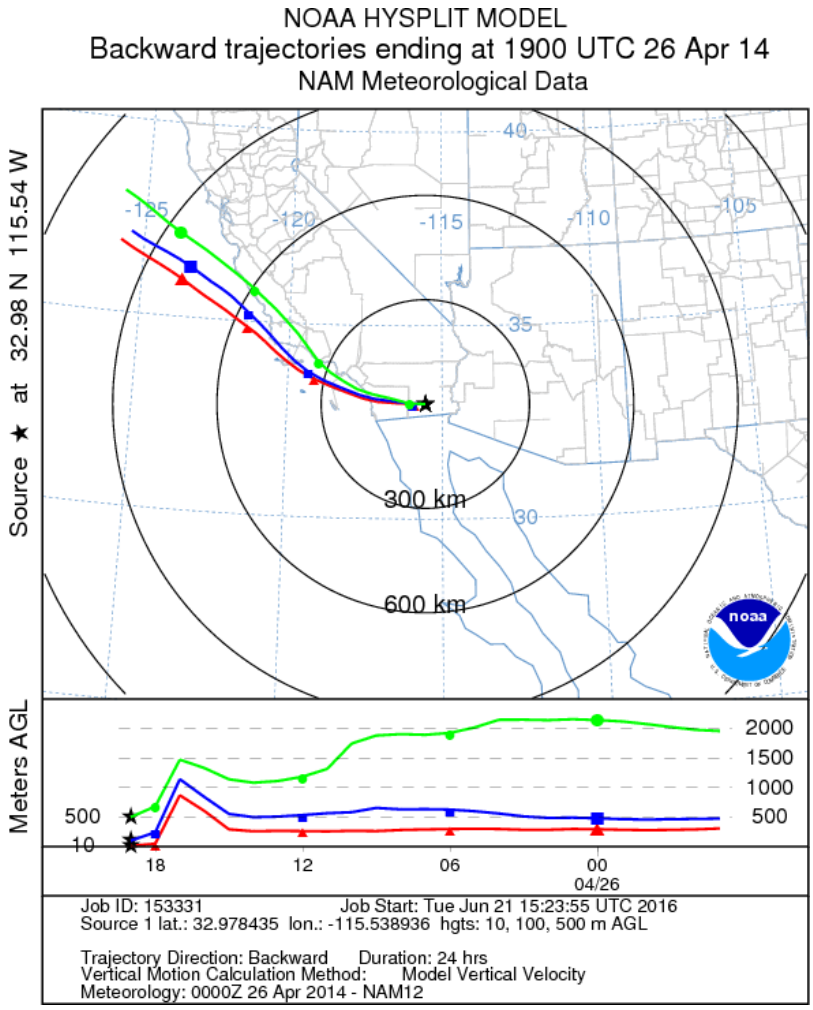


Fig 2-13: Brawley 24-hour back trajectory ending at 12:00 PDT on April 26, 2014 coincident with the measured hourly peak concentration. Red represents air movement at 10 meters above ground level (AGL); Blue represents air movement at 100 meters above ground level (AGL); Green represents air movement at 500 meters above ground level (AGL). Generated through NOAA Air Resources Laboratory HYSPLIT

Figure 2-14 illustrates the elevated levels of PM_{10} concentrations measured in Riverside, Imperial and Yuma, Arizona counties for a total of four days, April 24, 2014 through April 27, 2014. Elevated emissions transported into Imperial County affected the Brawley and Niland monitors when strong west winds, associated with the passage of a large and cold low-pressure system moved into southern California and into Imperial County on April 25, 2014 and April 26, 2014. The Brawley monitor measured the highest elevated concentrations during the late afternoon hours on April 25, 2014 and remained elevated through April 26, 2014.

FIGURE 2-14
96 HOUR PM_{10} CONCENTRATIONS AT REGIONAL STATIONS

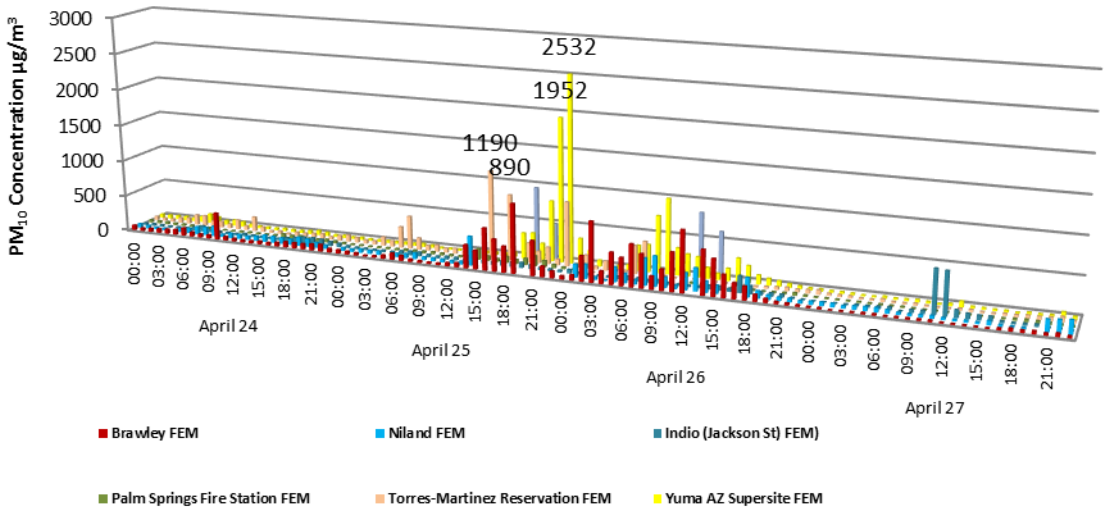


Fig 2-14: The graphical representation of the 96-hour relative PM_{10} concentrations at various sites in California and Arizona. The elevated PM_{10} concentrations at all sites on April 25, 2014 and April 26, 2014 illustrate the regional impact of the weather system. Air quality data from the EPA's AQS data bank

III Historical Norm

III.1 Analysis

While naturally occurring high wind events may occur seasonally and at times frequently and qualify for exclusion under the EER, historical fluctuations of the particulate concentrations provide insight into the frequency of events within an identified area. The following time series plots illustrate that PM_{10} concentrations measured at the Brawley monitor on April 25, 2014 and April 26, 2014, were unusual and in excess of normal historical fluctuations. The analysis also provides convincing evidence that the event affected air quality.

Figure 3-1 shows the time series of available FRM and BAM 24-hr PM_{10} concentrations at the Brawley monitor for the four year period of January 1, 2010 through April 26, 2014, for a total of 1,577 sample run days. Note that prior to 2013, FEM BAM data was not considered regulatory from 2010 to 2012. However, this difference between local (pre-2013) and standard conditions (2013 and on) reporting does not substantially affect percentile rankings. In order to properly establish the intensity of the event as it occurred on April 25, 2014 and April 26, 2014, 24-hour averaged PM_{10} concentrations were compiled and plotted as a time series from January 1, 2010 to April 26, 2014 to provide a historical perspective of PM_{10} concentrations.

FIGURE 3-1
BRAWLEY HISTORICAL
FRM AND FEM PM_{10} 24 HR AVG. CONCENTRATIONS
JANUARY 1, 2010 TO APRIL 26, 2014

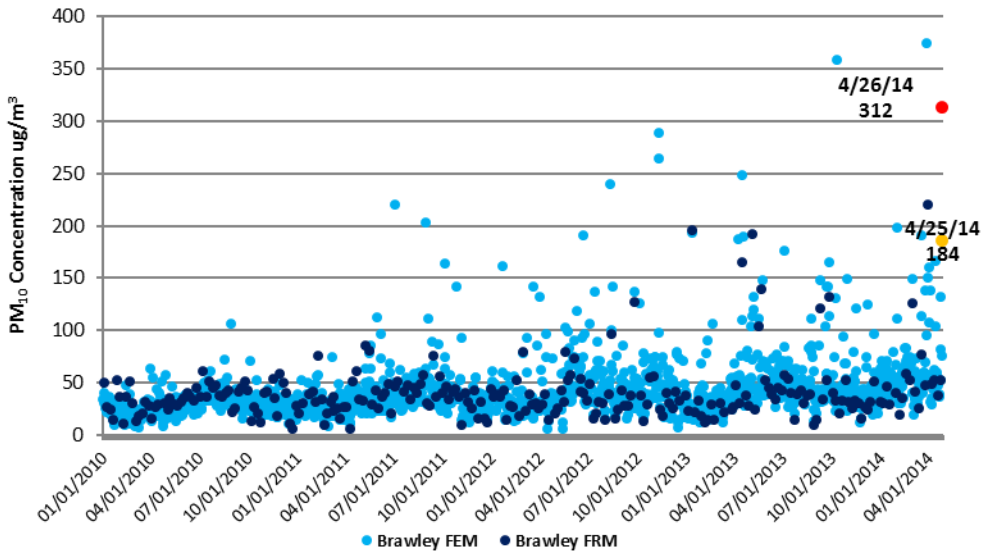
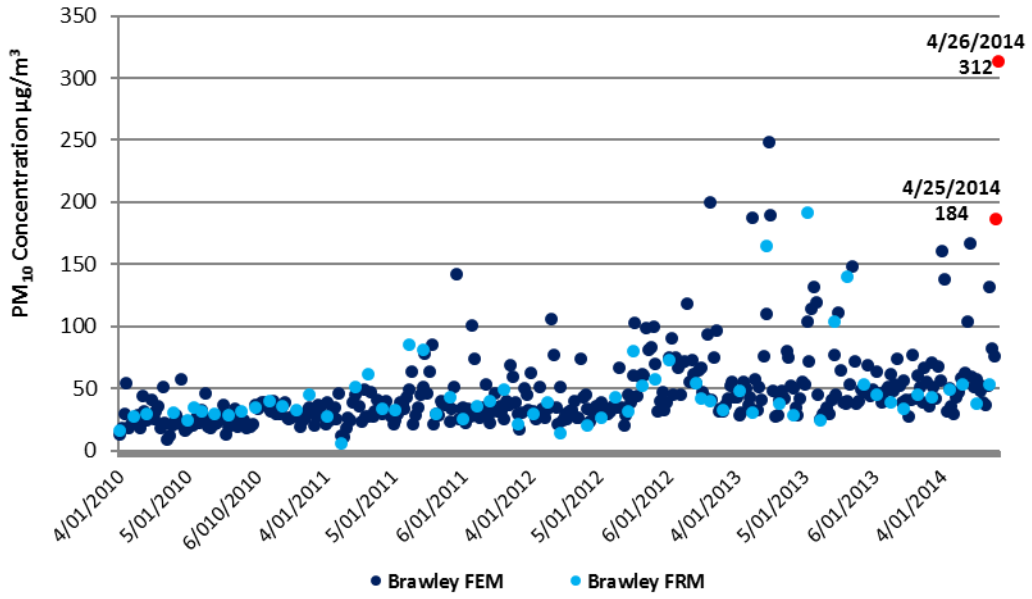


Fig 3-1: A historical comparison demonstrates that the April 25, 2014 and April 26, 2014, measured concentrations of 184 µg/m^3 and 312 µg/m^3 were outside the normal historical measurements. Air quality data from the EPA's AQS data bank

The time series **Figure 3-1** for Brawley includes 1,832 credible samples, measured by either FRM or FEM monitors between January 1, 2010 and April 26, 2014. Overall, the time series illustrates that of the 1,577 sampling days between January 1, 2010 through April 26, 2014, 22 exceedance days occurred which is less than a 1.5% occurrence rate. Of the 22-measured exceedance days, nine exceedances where measured during the second quarter (April through June). The remaining 13 occurred during the first, third and fourth quarters. No exceedances of the standard occurred during 2010. As mentioned above, FEM BAM data was not regulatory from 2010 to 2012.

FIGURE 3-2
BRAWLEY SEASONAL COMPARISON
PM_{10} 24 HR AVG. CONCENTRATIONS
***APRIL 1, 2010 THROUGH JUNE 30, 2014**



***April 1, 2010 through June 30, 2013 and April 1 2014 through April 26, 2014**

Fig 3-2: The seasonal historical comparison using the months of April through June for the years 2010 through 2014 (ending April 26, 2014) supports that the measured exceedances at the Brawley monitor on April 25, 2014 and April 26, 2014 were outside the normal historical norm. Air quality data from the EPA's AQS data bank

Figure 3-2 displays the seasonal fluctuations over 390 sampling days at the Brawley monitor for the months of April through June for the years 2010 through 2014. The Brawley monitor measured nine exceedance of the 454 credible samples, measured within 390 sampling days, which equates to less than a 2.5% occurrence rate.

FIGURE 3-3
BRAWLEY HISTORICAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
JANUARY 1, 2010 THROUGH JUNE 30, 2014

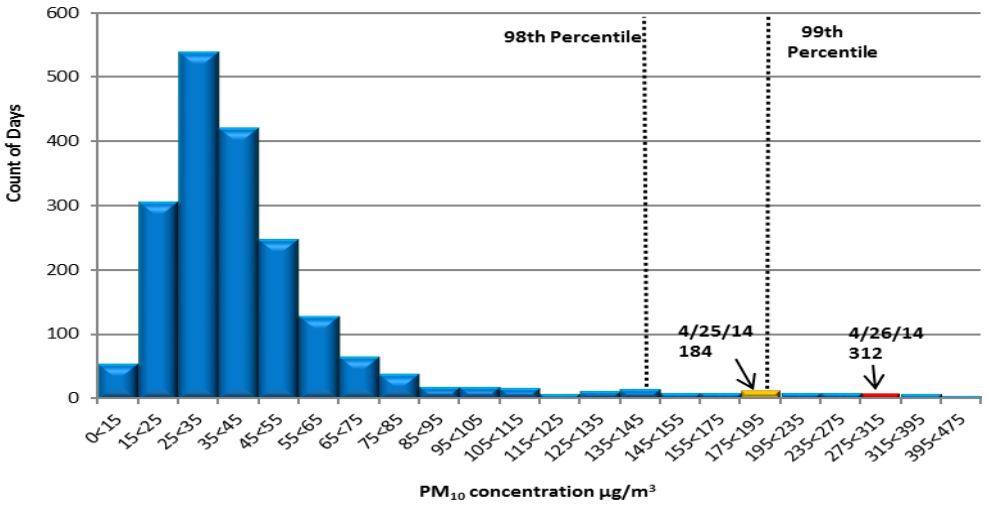
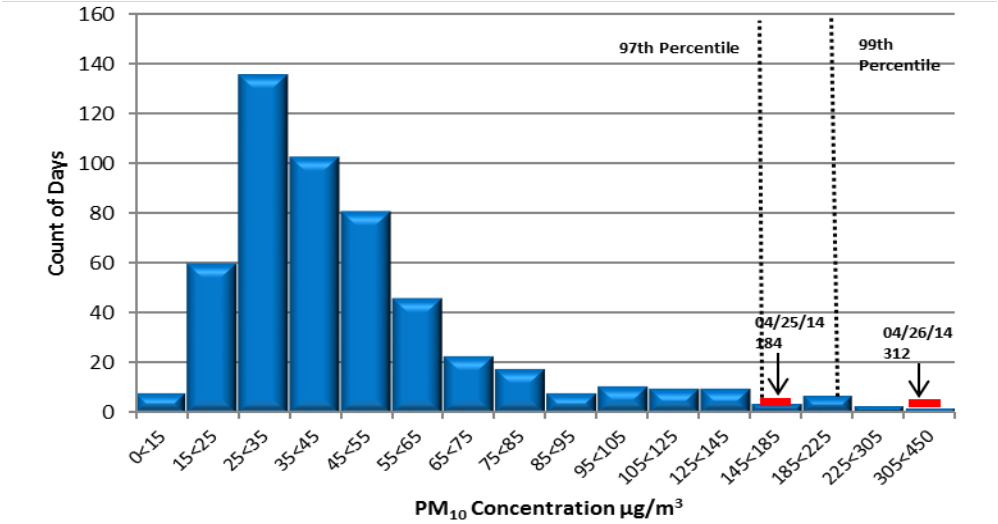


Fig 3-3: The 24-hr average annual PM_{10} concentrations measured at the Brawley monitor demonstrates that the April 25, 2014 exceedance was in excess of the 98th percentile, and that the April 26, 2014 exceedance was in excess of the 99th percentile

FIGURE 3-4
BRAWLEY SEASONAL
PM_{10} 24 HR FRM & FEM CONCENTRATIONS
***APRIL 1, 2010 THROUGH JUNE 30, 2014**



***April 1, 2010 through June 30, 2013 and April 1 2014 through April 26, 2014**

Fig 3-3: The 24-hr average seasonal PM_{10} concentrations measured at the Brawley monitor demonstrate that the April 25, 2014 exceedance was in excess of the 97th percentile, and that the April 26, 2014 exceedance was in excess of the 99th percentile

For the combined FRM and FEM datasets, the annual historical and the seasonal historical PM_{10} concentrations of 184 µg/m^3 and 312 µg/m^3 the percentile ranking are all above the 97th rank. Individually, on April 25, 2014 the measured concentration of 184 µg/m^3 fell in excess of the 98th percentile historically and the 97th percentile seasonally. On April 26, 2014 the measured concentration of 312 µg/m^3 fell in excess of the 99th percentile historically and seasonally.

Looking at the annual time series concentrations, the seasonal time series concentrations, and the percentile rankings for both the historical and seasaonal patterns, the April 25, 2014 and April 26, 2014, measured exceedances of 184 µg/m^3 312 µg/m^3 are clearly in excess of normal historical fluctuations, with seasonal exceedances of the NAAQS not occurring frequently.

III.2 Summary

The information provided above by the annual and seasonal time series plots and the percentile rankings, illustrate that the PM_{10} concentration and excess wind speeds observed on April 25, 2014 and April 26, 2014 occur infrequently. When comparing the measured PM_{10} levels on April 25, 2014 and April 26, 2014 and following USEPA EER guidance, this demonstration provides supporting evidence that the measured exceedances measured at the Brawley monitor were outside the normal historical fluctuations. This historical concentration data and the demonstration found under the clear causal relationship supports that the measured exceedances on April 25, 2014 and April 26, 2014 were an exceptional event and that it affected air quality.

IV Not Reasonably Controllable or Preventable

IV.1 Background

Inhalable particulate matter (PM_{10}) contributes to effects that are harmful to human health and the environment, including premature mortality, aggravation of respiratory and cardiovascular disease, decreased lung function, visibility impairment, and damage to vegetation and ecosystems. Upon enactment of the 1990 Clean Air Act (CAA) amendments, Imperial County was classified as moderate nonattainment for the PM_{10} NAAQS under CAA sections 107(d)(4)(B) and 188(a). By November 15, 1991, such areas were required to develop and submit State Implementation Plan (SIP) revisions providing for, among other things, implementation of reasonably available control measures (RACM).

Partly to address the RACM requirement, ICAPCD adopted local Regulation VIII rules to control PM_{10} from sources of fugitive dust on October 10, 1994, and revised them on November 25, 1996. USEPA did not act on these versions of the rules with respect to the federally enforceable SIP.

On August 11, 2004, USEPA reclassified Imperial County as a serious nonattainment area for PM_{10}. As a result, CAA section 189(b)(1)(B) required all BACM to be implemented in the area within four years of the effective date of the reclassification, i.e., by September 10, 2008.

On November 8, 2005, partly to address the BACM requirement, ICAPCD revised the Regulation VIII rules to strengthen fugitive dust requirements. On July 8, 2010, USEPA finalized a limited approval of the 2005 version of Regulation VIII, finding that the seven Regulation VIII rules largely fulfilled the relevant CAA requirements. Simultaneously, USEPA also finalized a limited disapproval of several of the rules, identifying specific deficiencies that needed to be addressed to fully demonstrate compliance with CAA requirements regarding BACM and enforceability.

In September 2010, ICAPCD and the California Department of Parks and Recreation (DPR) filed petitions with the Ninth Circuit Federal Court of Appeals for review of USEPA's limited disapproval of the rules. After hearing oral argument on February 15, 2012, the Ninth Circuit directed the parties to consider mediation before rendering a decision on the litigation. On July 27, 2012, ICAPCD, DPR and USEPA reached agreement on a resolution to the dispute which included a set of specific revisions to Regulation VIII. These revisions are reflected in the version of Regulation VIII adopted by ICAPCD on October 16, 2012 and approved by USEPA April 22, 2013. Since 2006, ICAPCD had implemented regulatory measures to control emissions from fugitive dust sources and open burning in Imperial County.

FIGURE 4-1
REGULATION VIII GRAPHIC TIMELINE DEVELOPMENT

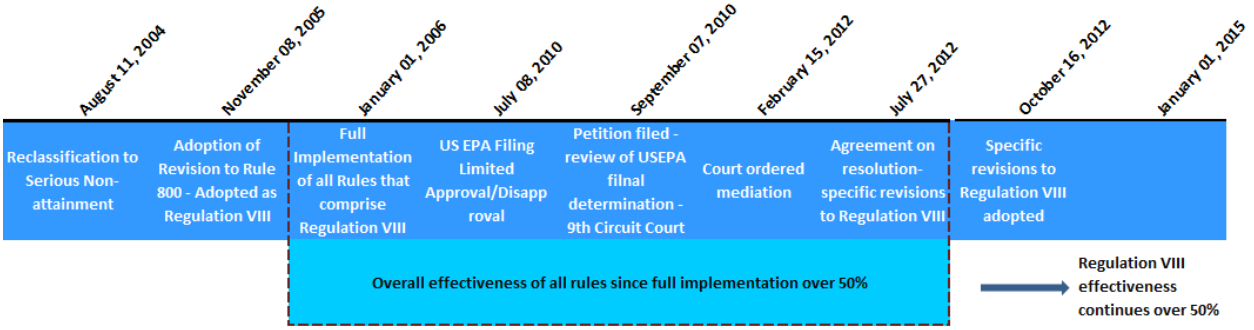


Fig 4-1: Regulation VIII Graphic Timeline

IV.1.a Control Measures

A brief summary of Regulation VIII, which is comprised of seven fugitive dust rules, found below. The **Appendix D** contains the complete set of rules.

ICAPCD's Regulation VIII consists of seven interrelated rules designed to limit emissions of PM_{10} from anthropogenic fugitive dust sources in Imperial County.

Rule 800, General Requirements for Control of Fine Particulate Matter, provides definitions, a compliance schedule, exemptions and other requirements generally applicable to all seven rules. It requires the United States Bureau of Land Management (BLM), United States Border Patrol (BP) and DPR to submit dust control plans (DCP) to mitigate fugitive dust from areas and/or activities under their control. Appendices A and B within Rule 800 describe methods for determining compliance with opacity and surface stabilization requirements in Rules 801 through 806.

Rule 801, Construction and Earthmoving Activities, establishes a 20% opacity limit and control requirements for construction and earthmoving activities. Affected sources must submit a DCP and comply with other portions of Regulation VIII regarding bulk materials, carry-out and track-out, and paved and unpaved roads. The rule exempts single family homes and waives the 20% opacity limit in winds over 25 mph under certain conditions.

Rule 802, Bulk Materials, establishes a 20% opacity limit and other requirements to control dust from bulk material handling, storage, transport and hauling.

Rule 803, Carry-Out and Track-Out, establishes requirements to prevent and clean-up mud and dirt transported onto paved roads from unpaved roads and areas.

Rule 804, Open Areas, establishes a 20% opacity limit and requires land owners to prevent vehicular trespass and stabilize disturbed soil on open areas larger than 0.5 acres in urban areas, and larger than three acres in rural areas. Agricultural operations are exempted.

Rule 805, Paved and Unpaved Roads, establishes a 20% opacity limit and control requirements for unpaved haul and access roads, canal roads and traffic areas that meet certain size or traffic thresholds. It also prohibits construction of new unpaved roads in certain circumstances. Single-family residences and agricultural operations are exempted.

Rule 806, Conservation Management Practices, requires agricultural operation sites greater than 40 acres to implement at least one conservation management practice (CMP) for each of several activities that often generate dust at agricultural operations. In addition, agricultural operation sites must prepare a CMP plan describing how they comply with Rule 806, and must make the CMP plan available to the ICAPCD upon request.

IV.1.b Additional Measures

Imperial County Natural Events Action Plan (NEAP)

On August 2005, the ICAPCD adopted a NEAP for the Imperial County, as was required under the former USEPA Natural Events Policy, to address PM_{10} events by:

- Protecting public health;
- Educating the public about high wind events;
- Mitigating health impacts on the community during future events; and
- Identifying and implementing BACM measures for anthropogenic sources of windblown dust.

Smoke Management Plan (SMP) Summary

There are 35 Air Pollution Control Districts or Air Quality Management Districts in California which are required to implement a district-wide smoke management program. The regulatory basis for California's Smoke Management Program, codified under Title 17 of the California Code of Regulations is the "Smoke Management Guidelines for Agricultural and Prescribed Burning" (Guidelines). California's 1987 Guidelines were revised to improve interagency coordination, avoid smoke episodes, and provide continued public safety while providing adequate opportunity for necessary open burning. The revisions to the 1987 Guidelines were approved March 14, 2001. All air districts, with the exception of the San Joaquin Valley Air Pollution Control District (SJAPCD) were required to update their existing rules and Smoke Management Plans to conform to the most recent update to the Guidelines.

Section 80150 of Title 17 specifies the special requirements for open burning in agricultural operations, the growing of crops and the raising of fowl or animals. This section specifically requires the ICAPCD to have rules and regulations that require permits that contain requirements that minimize smoke impacts from agricultural burning.

On a daily basis, the ICAPCD reviews surface meteorological reports from various airport

agencies, the NWS, State fire agencies and CARB to help determine whether the day is a burn day. Using a four quadrant map of Imperial County allowed burns are allocated in such a manner as to assure minimal to no smoke impacts safeguarding the public health. Finally, all permit holders are required to notice and advise members of the public of a potential burn. This noticing requirement is known as the Good Neighbor Policy. On April 25, 2014 and April 26, 2014 the ICAPCD declared no burn days **(Appendix A).** No complaints were filed for agricultural burning on April 25, 2014 and April 26, 2014.

IV.1.c Review of Source-Permitted Inspections and Public Complaints

A compiled query of the ICAPCD permit database was reviewed for active permitted sources throughout Imperial County and specifically around Brawley and Niland during the April 25, 2014 and April 26, 2014 PM_{10} exceedance. An evaluation of all inspection reports, air quality complaints, compliance reports, and other documentation indicate no evidence of unusual anthropogenic-based PM_{10} emissions. There were no complaints filed on April 25, 2014 and April 26, 2014, officially declared as No Burn days, related to agricultural burning, waste burning or dust.

IV.2 Forecasts and Warnings

The NWS Phoenix and San Diego offices issued high wind forecasts from the San Diego Mountains and deserts into the southwest and through Arizona. The NWS issued multiple advisories for the region, which included high winds and reduced visibility (**Appendix A**). Wind advisories on both April 25, 2014 and April 26, 2014, warned of the potential for strong winds with wind speeds between 20 to 35 mph, wind gusts up to 45 mph, and reduced visibilities due to windblown dust in Imperial County.

IV.3 Wind Observations

Wind data during the event were available from airports in eastern Riverside County, southeastern San Diego County, southwestern Yuma County (Arizona), northern Mexico, and Imperial County. Imperial Airport (KIPL) measured five hours of winds over 25 mph on April 25, 2014, with peak gusts of 40 mph. On April 26, 2014, KIPL measured one hour of winds over 25 mph, with a peak gust of 40 mph. El Centro NAF (KNJK) measured six hours of winds over 25 mph, with a peak gust of 49 mph on April 25, 2014. On April 26, 2014 KNJK measured nine hours of winds at or above 25 mph with a peak gust of 52 mph. Wind speeds of over 25 mph are normally sufficient to overcome most PM_{10} control measures. During the April 25, 2014 and April 26, 2014 event, wind speeds were above the 25 mph threshold overcoming the BACM in place.

IV.4 Summary

The weather and air quality forecasts and warnings outlined in this section demonstrate that strong west winds associated with a strong low-pressure system transported dust and caused an uncontrollable PM_{10} exceedance on two sequential days. The BACM list as part of the control

measures in Imperial County for fugitive dust emissions were in place at the time of the event. These control measures are required for areas designated as "serious" non-attainment for PM_{10}, such as Imperial County. Thus, the BACM in place at the time of the event were beyond reasonable. In addition, surface wind measurements upstream and at surrounding areas to the north and south of the Brawley station during the event were high enough (at or above 25 mph, with wind gusts over 40 mph) that BACM PM_{10} control measures would have been overwhelmed.

Finally, a high wind dust event can be considered as a natural event, even when portions of the wind-driven emissions are anthropogenic, as long as those emissions have a clear causal relationship to the event and were determined to be not reasonably controllable or preventable. This demonstration has shown that the event that occurred on April 25, 2014 and April 26, 2014 was not reasonably controllable or preventable despite the strong and in force BACM within the affected areas in Imperial County. This demonstration has similarly established a clear causal relationship between the exceedances and the high wind event timeline and geographic location. The April 25, 2014 and April 26, 2014 event can be considered an exceptional event under the requirements of the exceptional event rule.

V Clear Causal Relationship

V.1 Discussion

Meteorological observations for April 25, 2014 and April 26, 2014 identified a strong upper level trough with an associated cold front (Pacific storm) that moved inland across Southern and Central California creating strong gusty southwest to west winds that affected the counties of Riverside, San Diego, Imperial and Yuma.

As discussed above, the NWS discussions as early as Wednesday, April 23, 2014 provided information regarding the expected intensity of the approaching system. As is typical, the timing of the event can and does vary with each forecast discussion by each NWS office. The San Diego NWS office typically forecast west winds much earlier, by several days, than the Phoenix NWS and in many cases the San Diego NWS issues either warnings or advisories much sooner than the Phoenix counterpart. However, in this instance there was general agreement by both NWS offices on the nature of the impending strong and cold upper level trough. For example, the San Diego NWS office described the acceleration of surface onshore gradients as the low-pressure trough over the Northeast Pacific approached California as early as 0205 PST (0305 PDT) Friday, April 25, 2014. Likewise the Phoenix NWS office described the weather system as a Pacific storm and powerful cold front as leading to breezy to windy conditions as early as 0213 PST (0313 MST) Friday, April 25, 2014.

The deep Pacific trough had such an expected impact that both NWS offices issued several Urgent Weather Messages containing either wind advisories, high wind warnings or dust advisories. Issued Public Information Statements by the San Diego NWS office identified the highest measured winds in areas such as Volcan Mountain 74 mph, Borrego Springs 55 mph, In Ko Pah 51 mph, Camp 45 mph, and Ocotillo Wells 43 mph. Other Public Information Statements issued by the San Diego NWS office identified the strongest wind gusts in areas such as Volcan Mountain 74 mph, Borrego Springs 55 mph, In Ko Pah 51 mph, Thermal Airport 49 mph, Coachella 46 mph, Campo 45 mph and Ocotillo Wells 43 mph.

Entrained windblown dust from natural areas, particularly from the natural open desert areas west of Imperial County, within the San Diego Mountains and desert slopes, along with anthropogenic sources controlled with BACM is confirmed by the meteorological and air quality observations on April 25, 2014 and April 26, 2014.

Figure 5-1 is a collection of surface analysis maps that illustrate the low-pressure building over southern Nevada and into California. A packing of the pressure gradient over southeastern California led to high winds in the region.

FIGURE 5-1
SURFACE ANALYSIS COMPOSITE

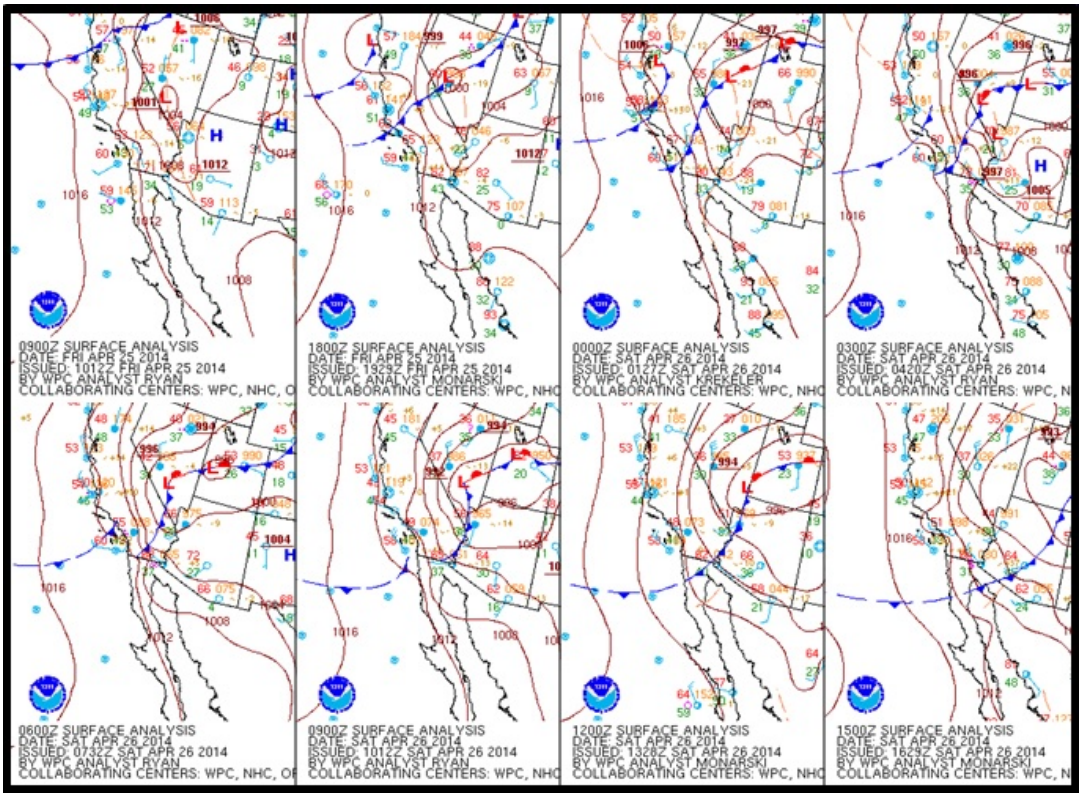


Fig 5-1: Surface analysis maps show the passage of a frontal system and the tightening of the pressure gradient that led to the high winds. Top from left: 0100 PST; 1000 PST; 1600 PST; 1900 PST on April 25, 2014. Bottom from left: 2200 PST April 25, 2014; 0200 PST April 26, 2014; 0400 PST; 0700 PST. The gradient was tightest at 2200 PST on April 25, 2014 coincident with the Imperial Airport measured wind speed of 29 mph with gust of 39 mph. NWS Weather Prediction Center Surface Analysis Archives

As explained above, the San Diego NWS office described the acceleration of surface onshore gradients as the low-pressure trough over the Northeast Pacific approached California as early as 0205 PST (0305 PDT) Friday, April 25, 2014. Likewise, the Phoenix NWS office described the weather system as a Pacific storm and powerful cold front. As the low-pressure strengthened over the Great Basin, surface onshore gradients deepened generating, strong gusty southwest to west winds over the San Diego Mountains and adjacent deserts.

Clearly, the expected impact by the Pacific trough led both NWS offices to issue several Urgent Weather Messages containing either wind advisories, high wind warnings or dust advisories. As mentioned before, the issued Public Information Statements by the San Diego NWS office identified the highest measured winds within the San Diego forecast areas. The notice identified measured winds speed at the Volcan Mountain of 74 mph, Borrego Springs 55 mph, In Ko Pah 51 mph, Campo 45 mph, and Ocotillo Wells 43 mph all sites surrounding Imperial County to the west within the San Diego Mountains. While these sites are not included in the figure below the Fish

Creek Mountain site, almost directly upstream of the Brawley monitor, did measure multiple hours of gusts 30 mph and above. On April 26, 2014, the Fish Creek Mountain site measured six hours of gusts over 40 mph with peak gusts of 47 mph.

Locally, both the El Centro NAF (KNJK) and Imperial County Airport (KIPL) measured multiple hours of winds (and gusts) above the 25 mph threshold. Winds in Imperial County began increasing during the noon hour on April 25, 2014 as reflected in the measured winds at both KIPL and KNJK and continued through April 26, 2014. By 1446 PST, KNJK reported dust and subsequent visibility dropped to 1.25 miles by 2056 PST. Much like KNJK, visibility dropped to 1.75 miles at KIPL by 1937 PST. KNJK measured six hours of winds above 25 mph with eight hours of gusts at or above 38 mph. KIPL measured five hours of winds above 25 mph and 10 hours of gusts at or above 31 mph.

The strongest measured winds occurred during the evening hours of April 25, 2014 and continued through the morning hours of April 26, 2014. KNJK measured nine hours of winds above the 25 mph threshold on April 26, 2014 while KIPL measured 10 hours of gusts at or above 31 mph. The HYSPLIT trajectory illustrates the slight airflow shift during the two-day event. The shift in airflow is similarly evident by the measured hours of WNW winds on April 26, 2014, as opposed to WSW on April 25, 2014 by KIPL. As these strong west winds, and gust increased concentrations remained elevated above 100 $\mu g/m^3$ over 20 hours beginning at 1400 PST April 25, 2014 through 1800 PST April 26, 2014. This allowed transported particulates to combine with overwhelmed local sources and suspend affecting air quality and affecting both the Niland and Brawley monitors.

Figure 5-2 is a graphical depiction that combines the HYSPLIT trajectory, upstream winds speeds and concentration times leading up to the exceedance at the Brawley monitor. It is perhaps of some worthy note to mention that the Niland monitor, more than likely would have also exceeded had not the instrument failed to function during the wind event.

FIGURE 5-2
EXCEEDANCE ANALYSIS APRIL 25, 2014 AND APRIL 26, 2014

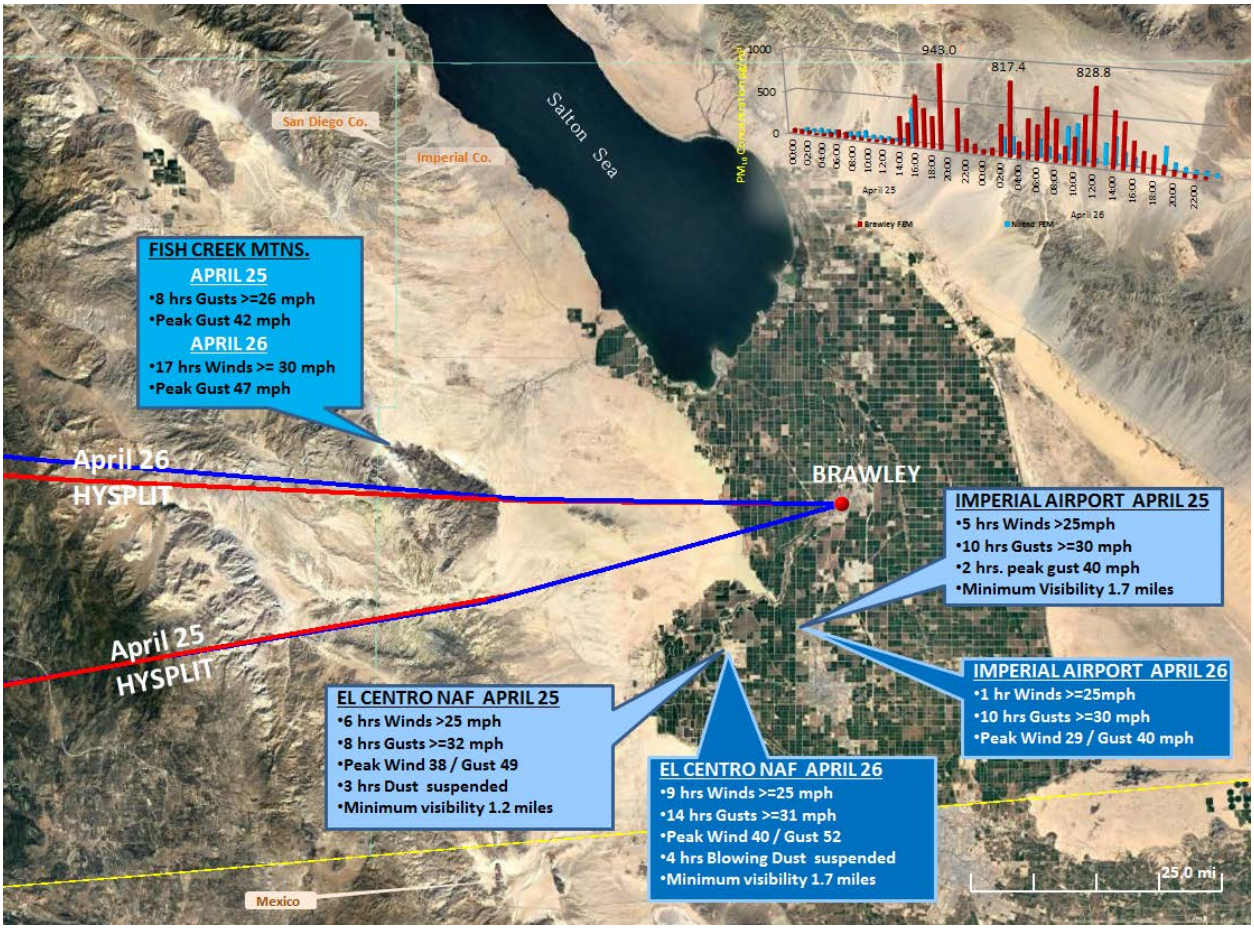


Fig 5-2: Strong west winds affected Imperial County on April 25, 2014 and April 26, 2014. The graphical image provides key wind speeds local airports and at the Fish Creek Mountain site. The HYSPLITS provide the path of airflow for April 25, 2014 and April 26, 2014. The April 25, 2014 HYSPLIT is an 8-hour back-trajectory ending at 1900 PST coincident with the hour of peak concentration for that day. The April 26, 2014 HYSPLIT is a 12-hour back-trajectory ending at 1200 PST coincident with the hour of peak concentration for that day. Red line is airflow at 10 meters AGL. Blue is 25 meters. Generated through NOAA's Air Resources Laboratory

The contrast of two satellite images of southeastern California captured on April 25, 2014 and April 26, 2014 identified as **Figure 5-3**, supports the analysis of transported dust into Imperial County from the west. The top image is a Terra MODIS image (~1030 PST) which captured the clouds, associated with the weather system over the Imperial County prior to the arrival of the winds on April 25, 2014. An Aqua MODIS image (~1330 PST) captured plumes of transported dust from the west, along the San Diego-Imperial County border, on April 26, 2014.

FIGURE 5-3
TERRA AND AQUA MODIS SATELITE IMAGES APRIL 25, 2014 AND APRIL 26, 2014

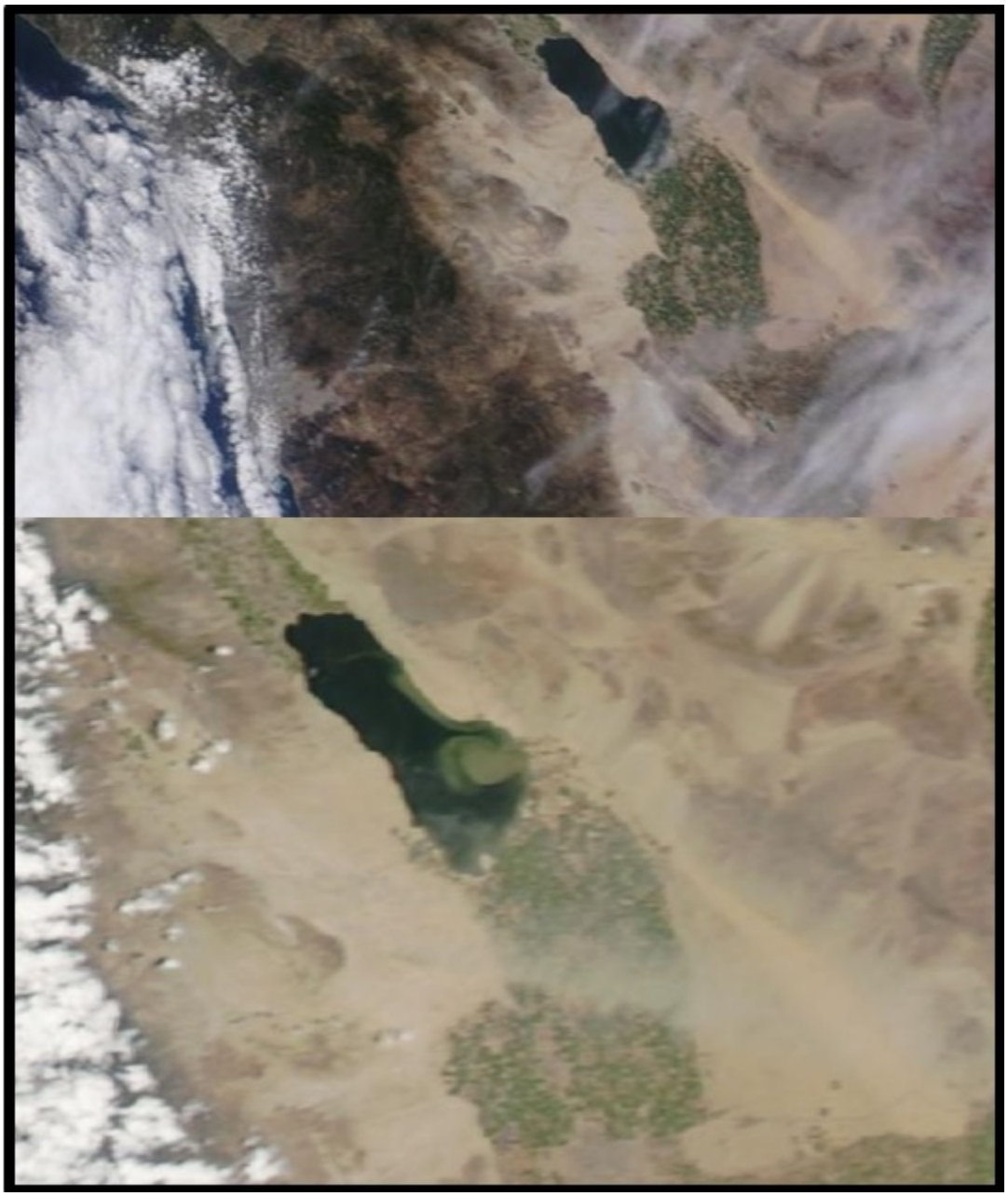


Fig 5-3: A Terra MODIS satellite image (top) as the clouds, associated with the weather system begin to stream into Imperial County, and an Aqua MODIS satellite image (bottom) coincident with the arrival of the gusty west winds on the afternoon of April 25, 2014 (~13:30) and mid-morning (~10:30) of April 26, 2014. The bottom image captured some of the dust. Images from AirNow Tech Navigator

Figure 5-4 combines three images from the Terra and Aqua MODIS satellite showing the Aerosol Optical Depth (AOD) over the region. Warmer colors indicate higher levels of AOD. The top image,

captured by a Terra satellite at ~1030 PST on April 25, 2014, shows moderate levels of AOD over the Imperial County. The following day (middle image) on April 26, 2014 the same satellite captured a greater amount of AOD over Imperial County coincident with increased winds on April 25, 2014. The bottom image is an Aqua MODIS satellite image (~1330 PST) which shows increased levels of AOD over Brawley in particular and generally in Imperial County. Prior to the capture of the image, KIPL, KNJK and the Fish Creek Mountain site measured strong westerly winds. These images provide additional supporting evidence of suspended and transported particulate matter in Imperial County on April 25, 2014 and April 26, 2014.

FIGURE 5-4
MODIS AEROSOL OPTICAL DEPTH SATELLITE IMAGES
APRIL 25, 2014 AND APRIL 26, 2014

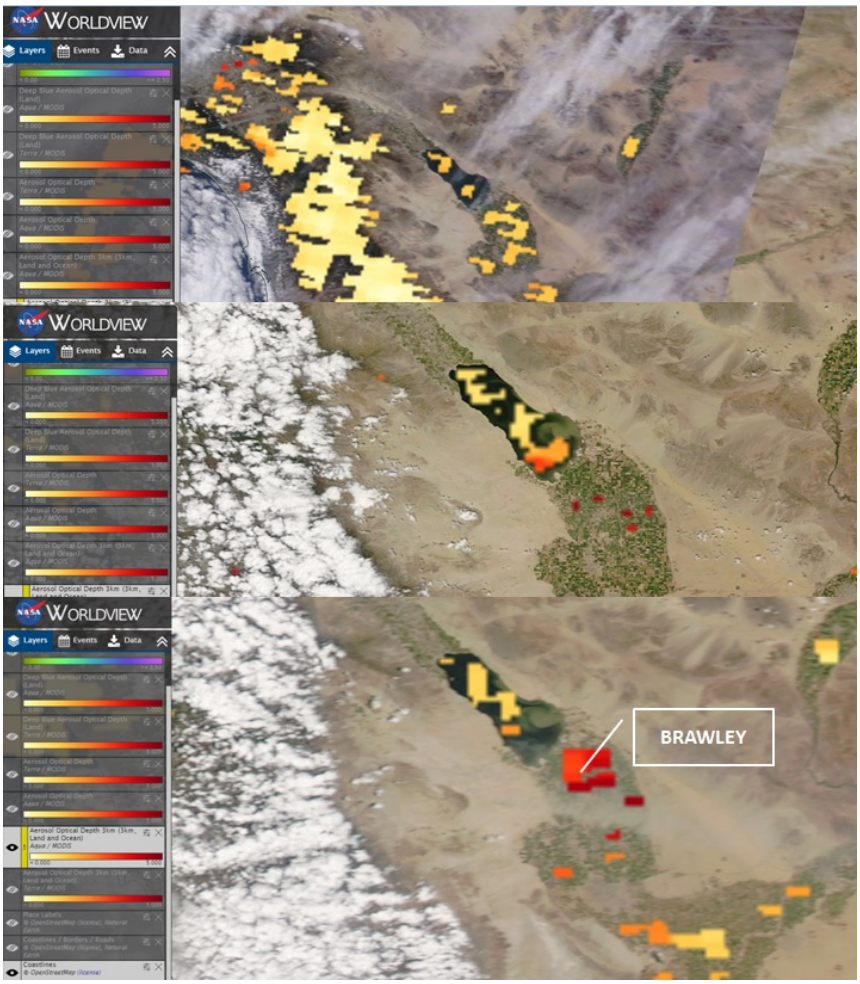


Fig 5-4: Three combined Terra and Aqua MODIS satellite images identifying the Aerosol Optical Depth over southeastern California on April 25, 2014 and April 26, 2014. Warmer colors indicate the presence of a greater abundance of AOD. Source: NASA's Worldview satellite imagery, https://worldview.earthdata.nasa.gov

Supporting the analysis presented above, a Smoke Text Product issued by NOAA's Satellite and Information Service, on April 26, 2014 (1000 PST), just after increased winds, identified an "area of blowing dust…originating near the Salton Sea". **Appendix A** contains copies of notices pertinent to the April 25, 2014 and April 26, 2014 event.

Figure 5-5 depicts the elevated wind speeds[7] throughout Imperial County, eastern Riverside County, southeastern San Diego County, Yuma, Arizona, and Mexicali, Mexico for four days, April 24, 2014 through April 27, 2014. The consistency for all stations is evident. For April 25, 2014, all stations measured elevated wind speeds shortly after 1200 PST. Most stations saw winds remain elevated as the system moved through the region on April 26, 2014. Winds started to diminish during the early morning hours of April 27, 2014. For detailed station meteorology graphs see **Appendix B.**

FIGURE 5-5
96 HOUR WIND COMPARISON OF NEIGHBORING SITES

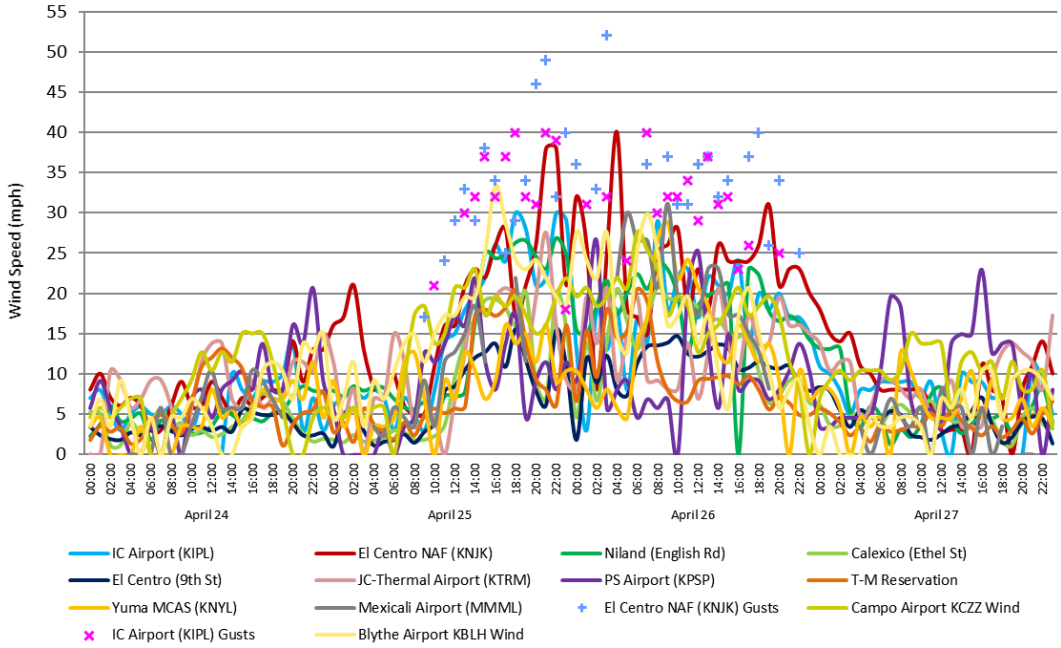


Fig 5-5: Wind data collected from twelve sites within the Imperial, Riverside, San Diego, and Yuma counties over a four-day period from April 24, 2014 to April 27, 2014, all show a uniform spike in wind speed during the April 25, 2014 and April 26, 2014 exceptional event. Wind data from the NCEI's QCLCD data bank, the EPA's AQS data bank, the University of Utah's MesoWest data bank, and the Weather Underground

Figures 5-6 demonstrates the spatial and temporal relationship between the elevated west winds and the transported dust into Imperial County, which affected the Brawley monitor on April 25,

[7] National Weather Service; NOAA's Glossary – Wind Speed: The rate at which air is moving horizontally past a given point. It may be a 2-minute average speed (reported as wind speed) or an instantaneous speed (reported as a peak wind speed, wind gust, or squall); https://w1.weather.gov/glossary/index.php?letter=w

2014 and April 26, 2014. Fluctuations in hourly concentrations at the Brawley monitor on April 25, 2014 and April 26, 2014 illustrates a positive correlation with wind speeds, particularly gusts at the Imperial County Airport (KIPL) and the El Centro NAF (KNJK). **Appendix C** contains additional graphs illustrating the relationship between the elevated PM_{10} concentrations and increased wind speeds from other monitoring sites within Imperial and Riverside counties on April 25, 2014 and April 26, 2014.

FIGURE 5-6
BRAWLEY 48 HOUR CORRELATION OF PM_{10} CONCENTRATIONS & WIND SPEEDS

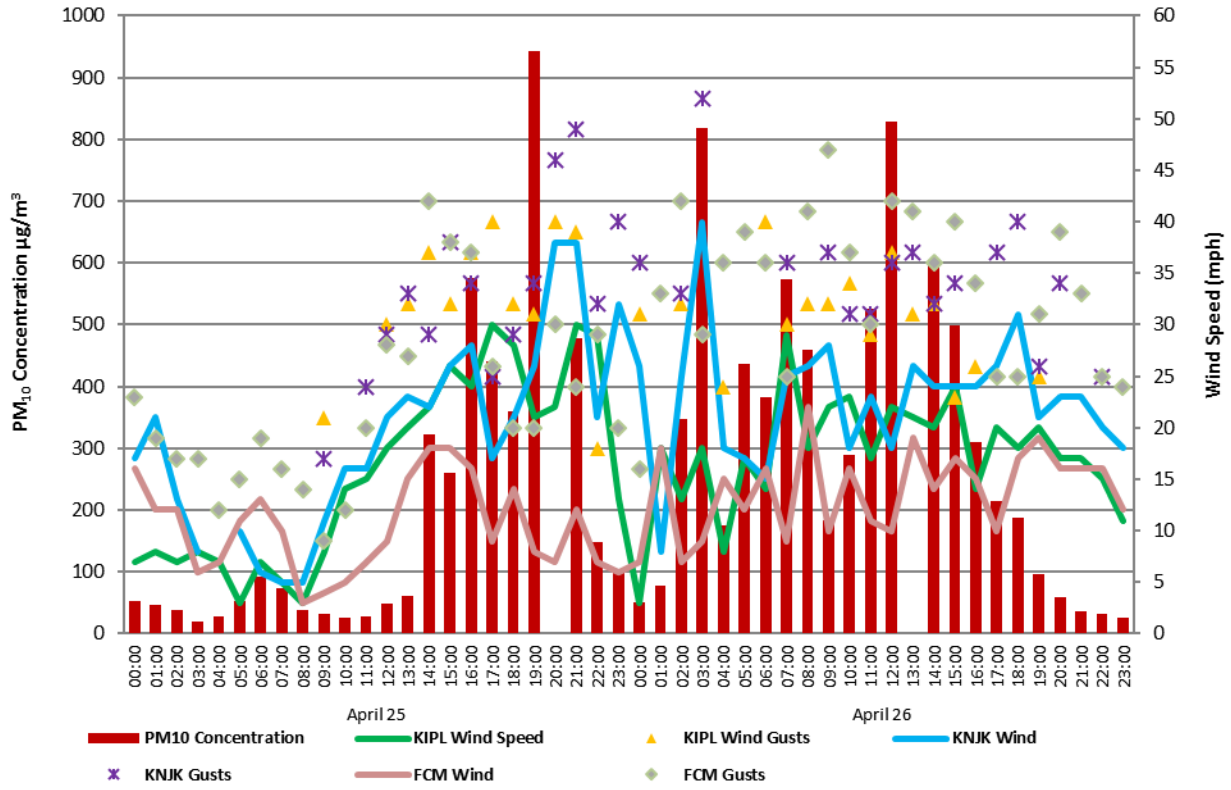


Fig 5-6: Fluctuations in hourly concentrations on April 25, 2014 and April 26, 2014 illustrate a positive correlation with wind speeds and gusts. The Imperial Airport (KIPL), El Centro NAF (KNJK), and the Fish Creek Mountain site were all upstream from Brawley. One gust at El Centro NAF reached 52 mph. Wind data from the NCEI's QCLCD data bank and the University of Utah's Mesowest data bank. Air quality data from the EPA's AQS data bank

Figure 5-7 is a four-day depiction from April 24, 2014 through April 27, 2014, of the PM_{10} concentrations for the Brawley monitor and upstream wind speeds. For April 24, 2014 and the morning hours on April 25, 2014, the Brawley monitor measured lower levels of concentrations as winds remained light. However, as winds increased during the afternoon of April 25, 2014 concentrations also rose. As winds increased shortly after midnight on April 26, 2014 so did

hourly concentration levels. Hourly concentration levels stayed elevated throughout most of the day until after 2000 PST when winds decreased to moderate levels.

FIGURE 5-7
BRAWLEY 96 HOUR CORRELATION OF PM_{10} CONCENTRATIONS & WIND SPEEDS

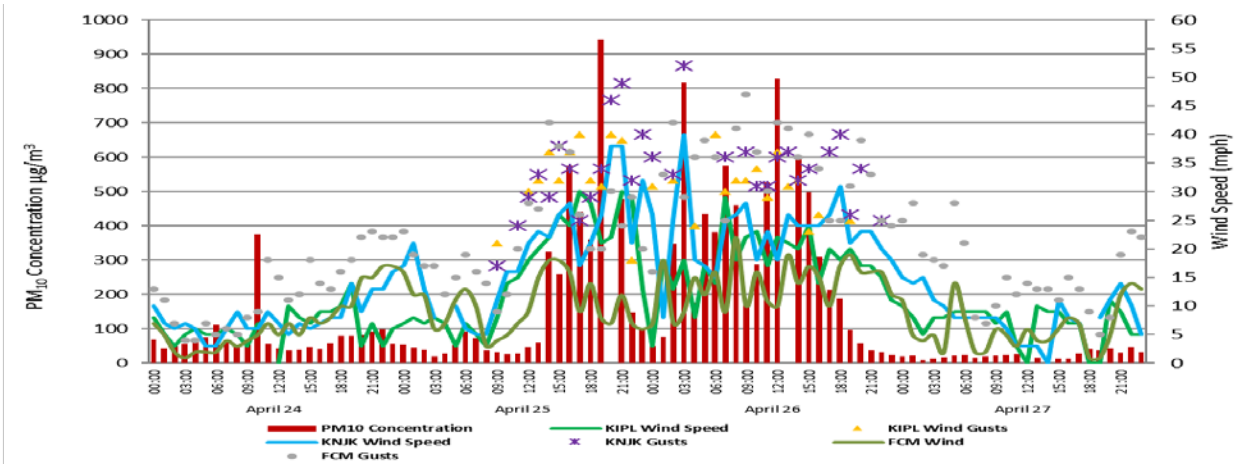


Fig 5-7: Fluctuations in hourly measured concentrations at the Brawley monitor increased as winds and gusts increased on April 25, 2014. As winds returned to moderately light conditions on April 27, 2014, so did hourly concentration levels. Wind data from the NCEI's QCLCD data bank and the University of Utah's Mesowest data bank. Air quality data from the EPA's AQS data bank

Figure 5-8 compares hourly PM_{10} concentrations and observed visibility at local airfields over a 96-hour period. Visibility dips during times when concentrations are at their highest.

FIGURE 5-8
96 HOUR TIME SERIES PM_{10} CONCENTRATIONS AND VISIBILITY

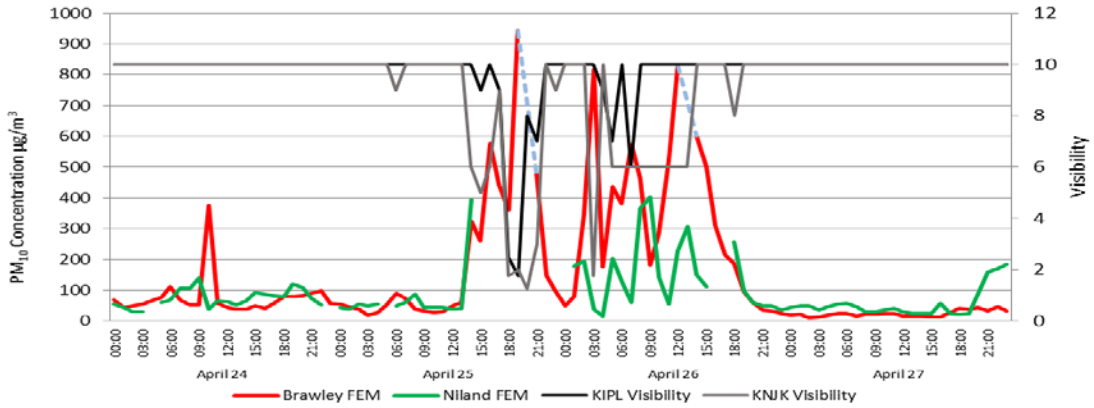


Fig 5-8: Illustrates the observed visibility from Imperial County Airport (KIPL) and El Centro NAF (KNJK). Visibility dips during those hours when concentrations spike. Air quality data from the EPA's AQS databank. Visibility data from the NCEI's QCLCD system

As mentioned above, both NWS offices issued several Urgent Weather Messages containing either wind advisories, high wind warnings or dust advisories in anticipation of the incoming Pacific trough. As the weather system moved through the region, transported and suspended dust affected air quality in Imperial County. A measurement of the degradation of air quality within a particular area can be discerned when index levels established to advise members of the public concerning air quality increase beyond a good level.

Figures 5-9 and 5-10 illustrate the level of the Air Quality Index (AQI) at the Brawley monitor on April 25, 2014 and April 26, 2014.[8] On April 25, 2014, as the weather system and accompanying winds increased, air quality degraded from "Yellow" or Moderate to "Orange" or Unhealthy for Sensitive Groups. On April 26, 2016, as suspended dust remained from the previous evening, air quality degraded from "Orange" or Unhealthy for Sensitive Groups to "Maroon" or Hazardous.

FIGURE 5-9
AIR QUALITY INDEX FOR BRAWLEY APRIL 25, 2014

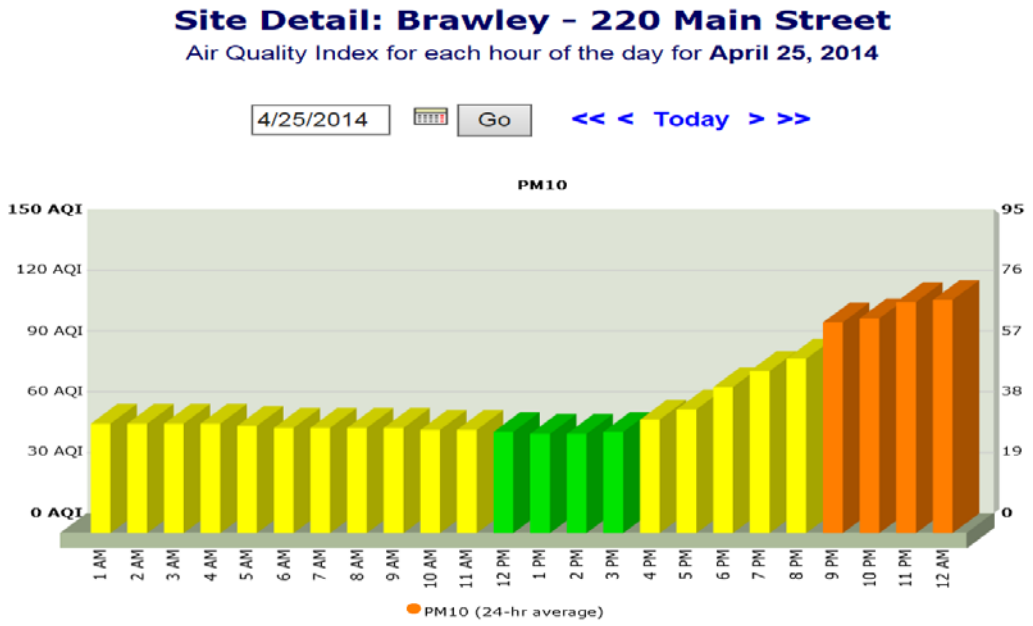


Fig 5-9: Reduced air quality is evident when warning go from Good or "Green" to Unhealthy for Sensitive Groups or "Orange"

[8] The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health .Ground-level ozone and airborne particles are the two pollutants that pose the greatest threat to human health in this country. Source: https://www.airnow.gov/index.cfm?action=aqibasics.aqi

FIGURE 5-10
AIR QUALITY INDEX FOR BRAWLEY APRIL 26, 2014

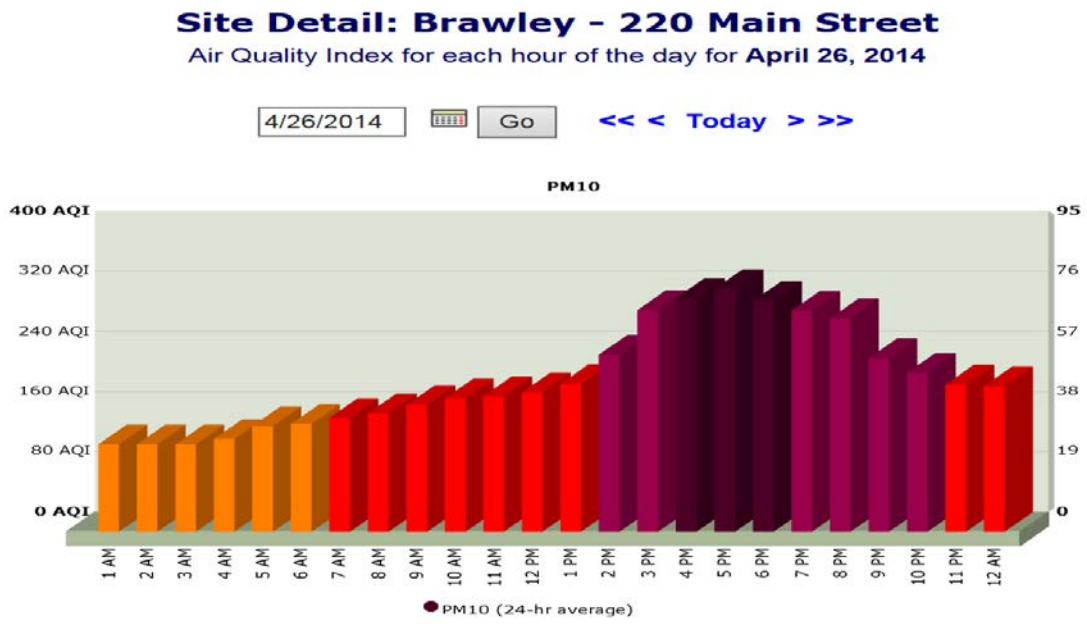


Fig 5-10: Reduced air quality is evident when warnings begin the day with "Orange" or Unhealthy for Sensitive Groups and degrades to "Maroon" or Hazardous

V.2 Summary

The preceding discussion, graphs, figures and tables provide wind direction, wind speed and concentration analysis, illustrating the spatial and temporal effects, caused by the passing strong upper level trough with associated cold front (Pacific storm). The Pacific storm moved inland across Southern and Central California creating strong gusty southwest to west winds that affected Imperial County on April 25, 2014 and April 26, 2014. The information provides a clear causal relationship between the transported windblown dust and the PM_{10} exceedance measured at the Brawley monitor on April 25, 2014 and April 26, 2014. Furthermore, the advisories and issued air quality indices illustrate the affect upon air quality within the region extending from all of Imperial County and the southern portion of Riverside County and Yuma, Arizona. Large amounts of coarse particles (dust) and PM_{10} transported by strong westerly winds into the lower atmosphere caused a change in the air quality conditions within Imperial County. The windblown dust, which originated from as far as the San Diego Mountains, passes and natural open desert areas and BACM controlled areas located within Imperial County affected air quality. Combined, the information demonstrates that the elevated PM_{10} concentration measured on April 25, 2014 and April 26, 2014 coincided with strong west winds and that strong west winds were experienced over the southern portion of Riverside County, all of Imperial County, and southwestern Arizona.

FIGURE 5-11
APRIL 25, 2014 AND APRIL 26, 2014 EVENT TAKE AWAY POINTS

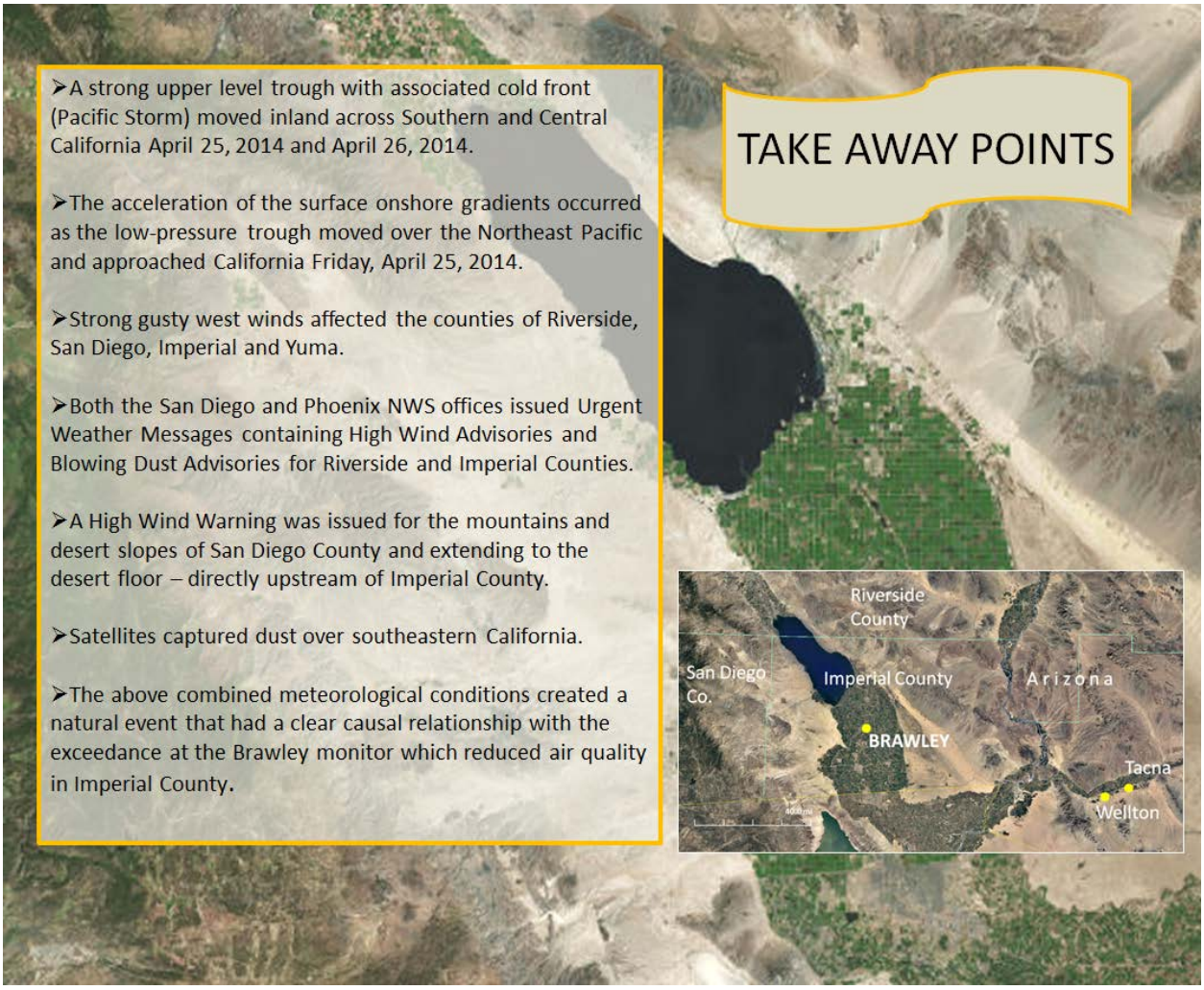


Fig 5-11: Is a summary of the meteorological conditions and facts that qualify the April 25, 2014 and April 26, 2014 event, which affected air quality as an Exceptional Event

VI Conclusions

The PM_{10} exceedances that occurred on April 25, 2014 and April 26, 2014, satisfies the criteria of the EER which states that in order to justify the exclusion of air quality monitoring data evidence must be provided for the following elements:

TABLE 6-1[9] Technical Elements Exceptional Event Demonstration for High Wind Dust Event (PM_{10})		Document Section
1	whether the event was **not reasonably controllable or preventable** (nRCP)	26-30
2	whether there was **a clear causal** relationship (CCR) "There is a clear causal relationship between the measurement under consideration and the event…	31-42
3	whether the event **affects air quality** (AAQ) ...the event that is claimed to have affected the air quality in the area";	13-21; 31-42
4	whether the event was caused by human activity unlikely to recur or was a natural event (HAURL / **Natural Event**) "The event satisfies the criteria set forth in 40 CFR §50.1(j)" for the definition of an exceptional event (see above);	13; 26-30

VI.1 Affects Air Quality

The preamble to the EER states that an event is considered to have affected air quality if it can be demonstrated that there is a clear causal relationship between the monitored exceedance and the event, and that the event is associated with a measured concentration in excess of normal historical fluctuations. Given the information presented in this demonstration, particularly section V, we can reasonably conclude that the event in question affected air quality.

VI.2 Not Reasonably Controllable or Preventable

In order for an event to be defined as an exceptional event under section 50.1(j) of 40 CFR Part 50 an event must be "not reasonably controllable or preventable." This requirement is met by demonstrating that, despite BACM in place in Imperial County, high winds overwhelmed all BACM controls. The PM_{10} exceedances measured at the Brawley monitor and discussed within this report was caused by naturally occurring strong gusty west winds that transported fugitive dust into Imperial County and other parts of southern California from areas located within the San Diego Mountains, passes and natural open desert regions to the west and southwest of Imperial County. These facts provide strong evidence that the PM_{10} exceedances on April 25, 2014 and April 26, 2014, were not reasonably controllable or preventable.

[9] 40 CFR §50.1

VI.3 Natural Event

As discussed within this demonstration, the PM_{10} exceedances, which occurred in Brawley on April 25, 2014 and April 26, 2014, were caused by transport of fugitive dust into Imperial County by strong predominantly westerly winds associated with a strong low-pressure system. The event therefore qualifies as a natural event.

VI.4 Clear Causal Relationship

The time series plots of PM_{10} concentrations at different areas in Imperial and Riverside County monitors demonstrates a consistency of elevated gusty winds and concentrations of PM_{10} at the Brawley monitor on April 25, 2014 and April 26, 2014 (section V). In addition, these time series plots and graphs demonstrate that the high PM_{10} concentrations and the gusty winds were an event that was widespread, regional and uncontrollable. Arid conditions preceding the event resulted in soils that were particularly susceptible to particulate suspension by the elevated gusty winds. Finally, days immediately before and after the high wind event had PM_{10} concentrations well below the NAAQS.

VI.5 Historical Norm

The historical annual and seasonal 24-hr average PM_{10} values measured at the Brawley monitor were historically unusual compared to a multi-year data set (Section III).

Appendix A: Public Notification that a potential event was occurring (40 CFR §50.14(c)(1)(i))

This section contains pertinent notices and discussions issued by the NWS offices in Phoenix and San Diego. In addition, the appendix contains copies of notices issued by the ICAPCD. The data show a region-wide increase in wind speeds and wind gusts coincident with the arrival of dust and high PM_{10} concentrations in Imperial County.

Appendix B: Meteorological Data

This appendix contains the time series plots, graphs, and wind roses for selected monitors in Imperial County used in this document. These plots, graphs, and tables demonstrate the regional impact of the wind event.

Appendix C: Correlated PM_{10} Concentrations and Winds

This appendix contains the graphs depicting the relationship between PM_{10} concentrations and elevated wind speeds for selected monitors in Imperial, Riverside, and Yuma, Arizona counties. These graphs demonstrate the regional impact by the wind event.

Appendix D: Regulation VIII – Fugitive Dust Rule

This appendix contains the compilation of the BACM adopted by the Imperial County Air Pollution Control District and approved by the United States Environmental Protection Agency. Seven rules numbered 800 through 806 comprise the set of Regulation VIII Fugitive Dust Rules.